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Sodium Chloride as a Possible Cause of Seeds in Glass

An Original Article Describing the Author's Extensive Research Along New Lines and Containing Much New Material of Importance to Glassmakers

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Introduction

This investigation was undertaken primarily to determine the identity of certain deposits that had been found in the seeds or blisters in the amber glass bottles made with Owens machines. Later, deposits of much the same character were found in the seeds in all glass made by the Owens process.

The investigation was extended to determine the laws governing the formation of these deposits and to ascertain the effect of pressure and temperature changes on the formation of these special seeds.

These deposits were found to be sodium chloride and water.

Historical

It has been known for some time that glass may contain dissolved sodium chloride up to 1.48 per cent. Gelstharp noted no effect on the quality of plate glass when this quantity was present. Silverman and Sutton made melts containing 1.41 per cent sodium chloride and noted an increased tendency toward devitrification. They noted that sodium chloride partially volatilized at temperatures from 750-1,050 deg. C. and that the amount found in glass was always less than the amount added to the batch or powdered glass before the melt was made. No attempt was made to note the effect of a pressure change on this volatilization.

Frink mentions finding sodium chloride among other compounds in seeds.

Preliminary Work

Much work was done with the microscope in studying and identifying the deposits found in the blisters. The usual methods of microanalysis were followed and the deposits were early identified as sodium chloride. These results were confirmed by petrographic methods. The crystal habit was cubic and the index of refraction was found to be the same as for sodium chloride.

A small micro-furnace was made and the deposits were watched during volatilization and condensation as the temperature of the furnace was raised and lowered.

Microphotographs were made and studied. These are shown in Figs. 1-8.

A typical blister caused by undecomposed sodium sulphate is shown in Fig. 9. These blisters are found much less frequently in flint bottle glass than in window glass as a smaller quantity of salt cake is used in the batch. When such a blister forms, the interior of the cavity is covered with a sulphate glass, having a different coefficient of expansion than the glass to which it adheres. When the article is cooled the sulphate glass becomes filled with minute cracks which give a whitish appearance to the blister.

A study of the microphotographs will show that the deposits on the interior surface of the seeds are condensation products. In nearly every case the part of the seeds deepest in the glass shows little or no deposit.

With the micro-furnace it was possible to watch the deposits change their character and eventually vanish as the glass containing the seed was heated. Upon cooling the volatilized sodium chloride and water would redeposit and this could be watched step by step. This redeposition would occur on different parts of the surface of the seed than it had formerly occupied.

Experimental Work

After the identification of the deposits was complete a series of melts was made in a specially prepared pyrex vacuum furnace similar to the one described by Washburn.

(*Continued on page* 156)

FIG. 1. MAG.—100 DIAM.

FIG. 2. MAG.—100 DIAM.

FIG. 3. MAG.—100 DIAM.

FIG. 4. MAG.—100 DIAM.

Fig. 1. In this microphotograph the deposits on the walls of a seed in amber glass are shown. These deposits consist of droplets of water containing sodium chloride. The arrangement of some of these deposits suggests that they are crystals but such is not the case, since the water which condensed last has dissolved the crystals of sodium chloride which was first deposited.

Fig 2. Here we have a deposit containing a greater amount of water than in Fig. 1. The droplets are larger and the amount of sodium chloride is less.

Fig. 3. This shows the same type of deposit as in Fig. 1.

Fig. 4. This shows very large deposits in a seed. The amount of sodium chloride and water was larger than in most of the other samples photographed. The deposits are of the same character as Fig. 1 and Fig. 3.

(Sodium Chloride as a Possible Cause of Seeds in Glass)

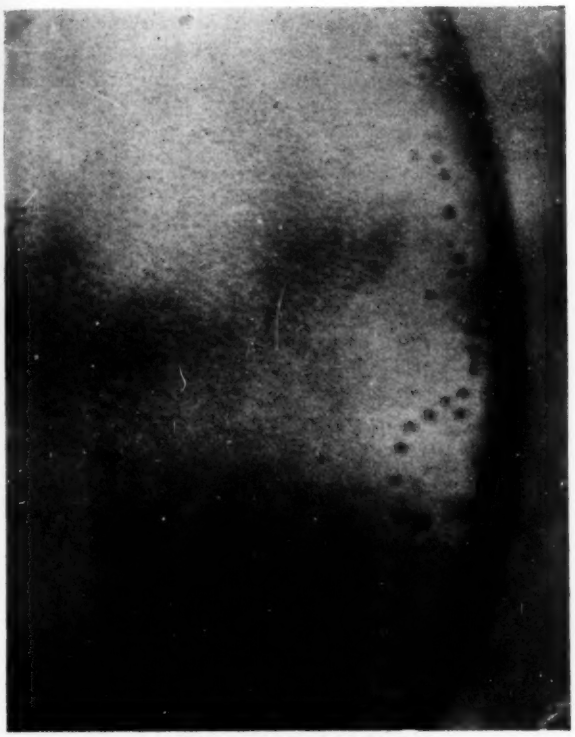

FIG. 5. MAG.—100 DIAM.

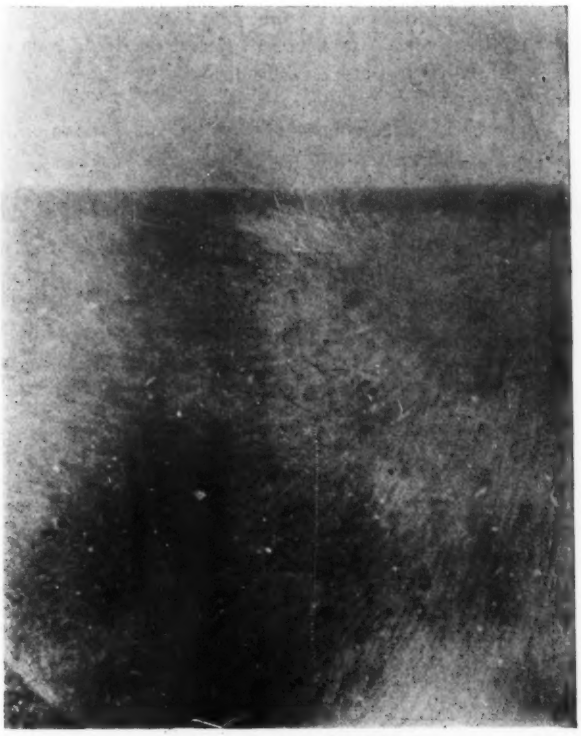

FIG. 6. MAG.—100 DIAM.

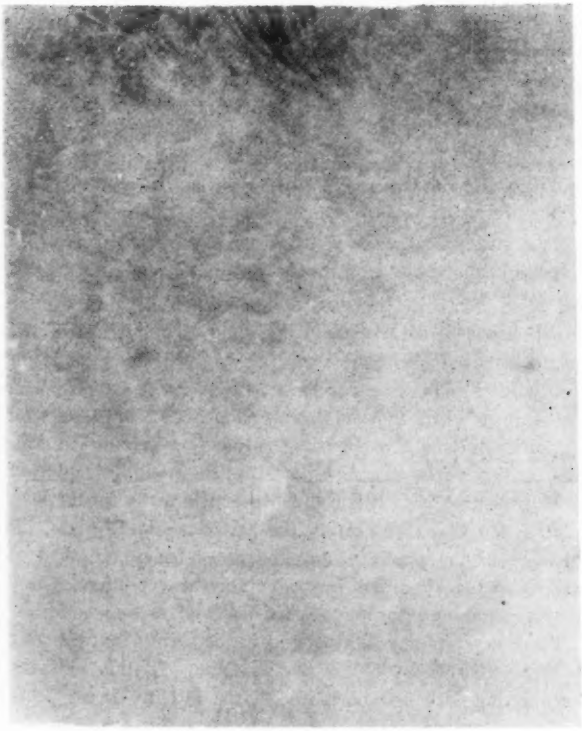

FIG. 7. MAG.—100 DIAM.

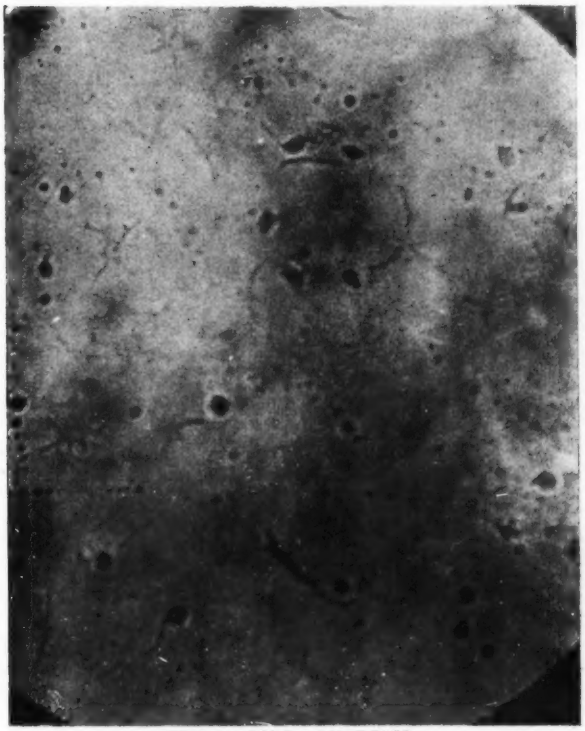

FIG. 8. MAG.—100 DIAM.

Fig. 5. In this microphotograph the edge of the seed is seen at the right of the figure. There are fine droplets of brine over the entire surface of the seed except at the edge where they are larger.

Fig. 6. In this photograph the edge of seed is shown extending right and left. There are a few scattered deposits on the interior surface of this seed.

Fig. 7. In this microphotograph we have deposits containing a very large amount of sodium chloride and a small quantity of water. The sodium chloride may be seen in large spots over the surface of the seed.

Fig. 8. This shows deposits of the same character as Fig. 2.

(Sodium Chloride as a Possible Cause of Seeds in Glass)

(*Continued from page* 153)

Both batch and cullet were melted and the deposits on the walls of the furnace and on the surfaces of the blisters in the melt were studied.

Some melts were made with extra sodium chloride added to the glass and some were made with the soda ash containing as low as .003 per cent NaCl.

The effect of changing the pressure, temperature, and time on the character of the deposits was investigated.

RESULTS

In all, twenty-six trial runs were made with the vacuum furnace. In no case where tank glass was melted did the sodium chloride fail to volatilize and deposit on the walls and in the seeds. And in no case was any other solid or liquid (other than water) condensed although gases were sometimes evolved.

FIG. 9. MAG.—40 DIAM.

This microphotograph shows the deposit of sodium sulphate over the interior of a blister or seed. The sodium sulphate has formed a glass that adheres to the surface of the seed and on cooling has cracked. This sulphate glass is readily soluble in water. The edge of the blister may be seen in the picture.

When glass was melted from batch where the soda ash was nearly free from sodium chloride practically no deposit formed on the walls and no deposits whatever were found in the seeds.

When sodium chloride was added to the glass an extra large amount of material was deposited and much remained in the glass. In such cases the amount of sodium chloride added to the glass was .50 per cent, or about three times the amount that would come from average quality soda ash.

It seems almost certain that dissolved substances, mainly sodium chloride, are a cause of seed in glassware made on Owens machines. The amount remaining in any glass varies with the pressure, and inversely with the time and the temperature.

DISCUSSION OF RESULTS

We have found that in Owens ware deposits are found in practically all seeds.

When a tank is being pulled slightly beyond its capacity for any given temperature and the glass is seedy as it comes from the refining chamber these deposits cannot be regarded as the cause of the seeds or blisters. In that case the glass never has been free from seed and the deposits are seldom found in the seeds. But where the glass is free from seed as it comes from the tank and becomes seedy in the revolving pot and the seeds are full of these deposits of sodium chloride it appears quite possible that incomplete heating allowed an increased amount of the sodium chloride to remain in the glass. Subsequent heating (and working) of the glass in the revolving pot caused the sodium chloride to volatilize and the seed or blister was formed.

In the case of amber glass the opacity of the "metal" to radiated heat waves insures that at the lower levels in the tank the glass is not sufficiently heated and the sodium chloride is present in such an amount that the glass is practically always on the verge of becoming seedy; the least abnormality in the operation throwing it over the line.

We know that when salt cake (10-23 pounds per 1,000 pounds of sand) is added to amber (Owens operation) the condition is very bad and enough sodium sulphate remains to fill the glass with blisters containing sodium sulphate.

Small quantities of sodium chloride have sometimes been used in glass batches. In such cases it is possible to have seed free glass if nothing is done to cause the salt to come out of solution. Motion, exposure to reduced pressure or to increased temperature will cause these sodium chloride blisters to form.

It is certain that for ordinary glass manufacture, pressing, gathering, etc., the presence of sodium chloride is without special effect. In these cases the glass is not reheated in a pot, nor moved about after coming from the tank as is the case with the Owens operation. Nor is the glass held at a temperature where it is fluid long enough to evolve seeds for a sufficiently long time; it being only a few seconds from the time it comes from the flowspout into the mold (a region of lower pressure) until it is a finished article ready for the lehr.

With the Owens operation the agitation of the glass, the lowering of the pressure, and the time element all tend to bring about a condition favorable for the evolution of any dissolved gas and for the volatilization of sodium chloride.

These deposits have been found in the foam about the plug in the trough outlet of an Owens tank. In this case the phenomenon is apparently due to the slightly lower pressure at that place.

If for any reason there is a scum over the glass in the melting chamber of the tank it is obvious that it acts as a shield and prevents the glass underneath from receiving the normal amount of heat. In that case more dissolved matter (sodium chloride and gases) will remain in the glass as a potential source of seeds.

Ash in Producer Fuel and Its Significance

By H. V. Renn*

In order to gain an idea of the utility of a fuel it is necessary to carry out a number of tests upon its physical and chemical properties. One of the most important of these tests is a determination of the "ash," which may be defined as representing the mineral matter in a fuel after ignition. Strictly speaking the ash not only consists of that derived from the actual fuel but also that from the impurities it may contain, such as gypsum, pyrites, etc.

The nature of the ash residue is of more importance practically than a simple statement of the quantity present as it serves to indicate to a great extent the behavior of the fuel during combustion.

If a comprehensive study of the nature and the properties of the fuel ash be made, it is possible not to exceed those temperatures at which excessive clinker formation is brought about and in this way to obtain an efficient rate of gasification.

Fuel ash consists generally of varying quantities of silica, alumina, iron oxide, lime, magnesia and alkalies, in addition to which are traces of other materials so small as to have negligible influence on the behavior of the fuel.

During the combustion of the fuel, the ash components form, according to the conditions prevailing at the time, complex systems of mixed compounds consisting of silicates and their eutectic mixtures. The formation of these silicates of low melting points and the eutectics of even lower melting points gives rise to a slag that may "clinker" at low temperatures.

It is not possible to state definitely from a study of the nature of an ash the temperature at which clinkering, if any, will result. The complexity of the silicate formations and the differences brought about in their structure by variations in the temperature and other conditions prevailing at the time, are not yet sufficiently understood to predict the subsequent behavior of a fuel from a laboratory examination of its ash. It is well known that if the ash consists wholly of silica and alumina no formation of clinker will take place at normal temperatures, due to the fact that the resulting bisilicates are in a highly viscous state over a range of temperature considerably above their melting points. The effect of such fluxes as iron oxide and lime is to lower the melting point of the ash and to increase the fluidity, those compounds or eutectics possessing the lowest melting points gradually flowing from the bulk of the ash through the fuel bed, collecting in their passage non-molten materials, until they reach the cooler parts of the producer where they form a bed of clinker.

It is not possible to specify any one definite temperature at which clinkering will take place for it largely depends upon the quantity of lowest melting point compounds separating from the bulk. Generally speaking, the lower the temperature at which the ash reaches a state of fluidity, the greater will be the difficulty from clinker formation.

Useful information can be gained in this direction from a fusibility test on a cone prepared from the ash. The range of temperature required for the complete deformation of the cone, that is, the temperature at which the cone commences to deform to that when it finally collapses into a spherical blob. can be regarded as the range of temperature at which clinker within the narrow limits of 20° C., but on the other extreme 200° C. may be required. An example of the variation possible is furnished by the report by Fieldner and Hall upon two American coals. The analyses of the respective ash quantities were given as follows:

	(A)	(B)
SiO_2	42.2%	50.4%
Al_2O_3	30.6%	24.0%
Fe_2O_3	19.0%	20.4%
TiO_2	1.2%	1.4%
CaO	1.3%	1.7%
MgO	1.0%	0.2%
Alkalies	4.2%	2.0%
SO_3	0.2%	0.3%

(A) Range of temperature required for deformation of cone, 218° C.
(B) Range of temperature required for deformation of cone, 20° C.

In is recommended by Constram (*J. Gas Lighting*, Vol. 124, 1913) that 1,200° C. should be the lowest point of fusion of the ash. This is very low and in the author's opinion 1,350 or 1,400° C. would be a much safer standard. An idea of the composition of an ash melting at these temperatures can be gained by a study of the table published by Dunn. (*Soc. Chem. Ind.*, January, 1918), and reproduced here.

It will be noticed from the table that the melting point of

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TABLE GIVING CHEMICAL COMPOSITION OF SAMPLES OF COAL ASH AND THEIR MELTING POINTS.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Silica	25.90	45.50	36.90	40.80	40.40	37.40	42.10	42.70	45.40	41.20	46.93	49.30	43.30	47.10	48.50	51.10	51.80	51.15	51.89
Alumina	17.46	25.69	25.82	31.36	29.34	28.21	30.67	35.05	35.53	33.45	33.23	35.40	38.88	37.39	36.93	35.93	38.25	44.70	44.59
Ferric oxide	16.86	19.00	25.00	24.00	15.21	22.14	21.71	8.79	12.57	17.14	8.14	7.29	11.71	11.14	7.36	4.86	5.64	1.25	0.98
Manganese oxide	trace	0.20	0.30	0.20	0.30	0.25	0.30	trace	none	0.40	0.20	0.30	0.90	0.40	0.10	trace	trace	trace	none
Lime	22.80	2.09	3.71	1.19	4.61	4.65	0.99	5.84	3.54	3.79	5.24	2.96	1.36	0.82	3.33	2.78	0.45	0.15	0.38
Magnesia	3.22	1.16	2.10	0.36	1.96	1.67	0.76	1.30	1.23	1.78	0.95	1.34	0.43	0.65	1.08	0.80	0.74	0.36	0.38
Alkali	2.70d	2.68	4.79	1.15	7.23	4.23	2.55	2.09d	0.83	0.83	2.82	1.90	2.12	1.38	1.54	3.32	1.71	1.20d	1.77
Titanium oxide	0.74	1.31	1.38	0.94	0.95	1.45	0.92	1.16	0.90	1.41	2.49	1.51	1.31	1.12	1.16	1.21	1.41	1.15	0.15
Sulphuric anhydride	8.91	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Phosphoric anhydride	1.55	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Quicklime	5.95	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Baryta	....	2.37	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Melting-point, ° C.	1020	1150	1150	1200	1230	1330	1340	1380	1380	1390	1415	1460	1460	1460	1480	1480	1500	....	....

the ash increases in proportion to the silica and alumina, provided that these components are present in the quantities necessary for the formation of bisilicate of alumina. The effect of an excess of silica is to lower the melting point, the tendency being the formation of lower silicates with the more fusible components. An example of this is shown by No. 2 in Dunn's table. The composition of the ash corresponding to this number is

Silica	45.50%
Alumina	25.69%
Iron Oxide	19.00%
Lime, Magnesia, Alkalies, etc.	9.71%

The melting point of the above ash was given as 1,150° C., which is excessively low. In a case (No. 10 in Dunn's table) where the alumina was that demanded by the equation Al_2O_3, $2SiO_2$, the melting point was 1,390° C., the iron content being little less than in No. 2, the first example quoted. The analysis of this composition is as follows:

Silica	41.20%
Alumina	33.45%
Iron Oxide	17.14%
Lime, Magnesia, Alkalies, etc.	8.21%

From the data furnished by Dunn's table it would seem that to avoid excessive clinkering an ash of the following general composition would be necessary. The silica content should be a minimum of 42-45 per cent and the alumina 33-35 per cent. The iron content should not be more than 15-20 per cent and this quantity is only permissible when the alumina is present in the proportion required to form bisilicate of alumina with the silica. Lime should not exceed 10 per cent, but quantities in excess of 35 per cent increase the point of fusion. The quantity of water soluble salts, such as sodium sulphate, should not be more than 10 per cent as the tendency of these salts is to form eutectics that reach a state of fluidity at temperatures even lower than their own melting points. Excess of water soluble salts indicates a useless fuel.

History of the Production of Natural Gas in West Virginia*

Wallace Gribble†

Some time prior to 1860, the northern portion of Virginia, now West Virginia, attracted more or less attention by its oil production from what is now called the shallow sands, but no gas worthy of mention was found in the search for oil at that time. This oil production was restricted to a few small fields, and after they were well defined by tests, further prospecting for oil ceased, until about 1899, when northern West Virginia began to receive attention from prospectors. Large acreage was taken under contracts of lease for oil and gas, and test wells started.

First among these tests proved non-productive, until the one on the Hamilton farm near Mannington was drilled into the Big Injun sand, which showed the presence of oil. Following this find of oil, prospecting became very active in this vicinity, as well also over the Counties in the northern part of the State. Further tests in the vicinity of Mannington proved very rich in oil, but no gas had as yet been found and all of these operations were fueled with coal and wood.

The South Penn Oil Company was conducting the development at Mannington and most of the outside prospecting. Its management requested its geologist to spot a location somewhere in its leased territory for a test well for gas. The geologist made a location on the Charles Hibbs, which, when the well was drilled into the sand, proved not disappointing to the operator or geologist, and yielded gas in great volume. A portion of this gas was appropriated for fuel. It was the first dry gas well drilled in West Virginia, from which the production was utilized for fuel, and the beginning of the development for the largest gas field of record. Statistics show that West Virginia stood at the top in gas production and it is now and has been for a number of years, furnishing heat for more than one million families.

Drilling for oil, following its discovery in the Hamilton well, became general in the northern counties of West Virginia, and a great many large oil producing fields were discovered and the State soon took its place among the leading ones in point of oil production. In this drilling campaign, oil was the object sought and no consideration was given to gas, it being considered worthless, except so far as it could be used for fuel in operation. An operator, in starting the drilling of a well, staked his money in the belief and hope that he would find oil, but if this test proved non-productive of oil, he then hoped to escape with a complete dry hole, and not be burdened with or afflicted with a large gas well. However, the operator could not escape sharing his proportion of the burden of gas that fell to his lot. The most prominent and well known gas wells among those discovered in the search for oil, are as follows: Morgan in Wetzel, Big Moses in Tyler, McConkey in Harrison, Camden in Lewis, Slussar and Dotson in Doddridge, Bush in Ritchie and Rymer in Gilmer. The three large producing gas sands in northern West Virginia were the Big Injun, Gordon and Fifth. The initial rock pressures on these sands were as follows: Big Injun from 600 to 700 pounds; Gordon 900 to 1,000 pounds; Fifth 1,100 to 1,200 pounds.

Possibly the most noted among the large gas wells found in West Virginia was what has always been known as the "Big Moses," located on Indian Creek in Tyler County. This well was drilled into the Big Injun sand some time in 1894 and its volume was so great, the operator could do nothing but let it blow open the full size of casing, which continued for about three or four years before it had so exhausted to a

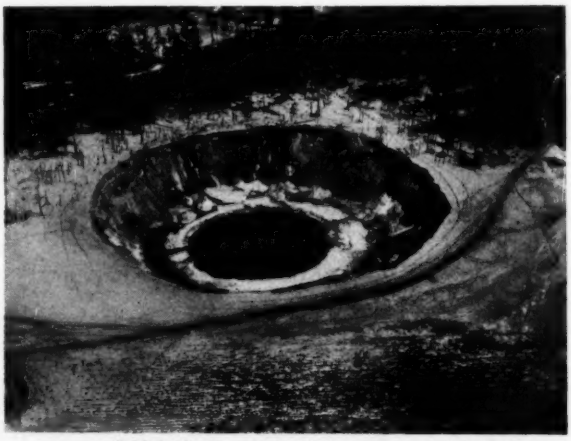
*Paper presented at the 1925 Convention of the Ohio Gas and Oil Men's Association.

†Charleston, W. Va.

point that the operator could shut it in and control its output. I frequently visited this well while it was blowing open and witnessed its tremendous belching forth from the earth into the open air, millions upon millions of cubic feet of gas per day. The roaring from this well made it impossible to carry on a conversation or even to understand one another within many hundred feet removed. I frequently saw this well when on fire and the flames would extend into the air about 150 feet from the mouth of the hole. The illumination from this fire made the night as light as day in all that section of the surrounding country. It was an impossibility to gauge the open flow of this well as well as many of the others heretofore mentioned and their actual open flow output will never be known, but from my observations of these wells as now compared with the reading of a gauge on the initial open flow of the present day well, I am convinced that the most extravagant estimate placed upon the open flow of these wells was far too conservative.

The Active Period

From 1890 to 1900 the searching for and producing of oil in West Virginia was very active and by reason of this activ-



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GREATEST "GAS CRATER" EVER KNOWN

This "artificial volcano," now extinct, started when Arkansas oil well drillers struck a big gas pocket. For four months gas and flame belched forth from the hole hurling mud, stone and sand hundreds of feet into the air. Sparks from colliding stones would ignite the gas in mid-air and for days at a time, until choked off by mud and sand, the whole country side would be brightly illuminated.

Now all the drillers have to show for their work is a hole 600 feet in diameter at the surface and 150 feet deep.

ity, it was fully determined that the Counties of Monogalia, Marion, Marshall, Wetzel, Tyler, Pleasants, Wirt, Ritchie, Doddridge, Harrison, Lewis, Braxton, Calhoun, Clay, Roane, Kanawha, Lincoln, Boone and Cabell, were great gas fields. It was indicated at that time and has since been fully proven by tests, that these Counties possessed many square miles of solid gas producing territory without a single dry spot in the area. To better illustrate this statement, in what is known as the Fifth sand pool in the western part of the Counties of Harrison and Lewis, one single operator drilled its number 1 to 700 wells without finding a single dry hole.

As the drilling continued, the production of gas augmented without any appreciable demand or market of any character. Soon all the available cities and towns in West Virginia were more than supplied with natural gas for fuel and lights. All of the towns within reasonable distance of producing gas wells, were lighted at night with open flambeau burners, which made the towns as light at night as day. Also the farmer appropriated gas to light up his farm premises at night and the supply was too great to demand that he shut down the lights in day. No consideration whatever, was given to conservation of gas and every one felt he was called

Underwood & Underwood

THIS WELL CAME IN WITH A ROAR

under tremendous pressure, when the drillers tapped an underground pocket of gas and oil.

upon to contribute his mite to waste this great fuel. The belief prevailed that the supply of natural gas in West Virginia was inexhaustible, and no one could be convinced that time would come within a few years indicating a gas shortage in West Virginia.

After West Virginia had attracted the attention of the outside to its great gas production and possible gas territory, and the cheapness at which the fuel could be had, a great many industries were located in the State at points convenient to gas supply and contracts were made by operators to supply them with gas at a price from one to two cents per thousand cubic feet. Also West Virginia gas attracted carbon black manufacturers who came into the Counties of Harrison, Lewis, Doddridge, Calhoun, Roane, and Kanawha, leased up large territory of proven gas, built large plants.

Markets All Supplied

By this time the markets convenient to the gas producing fields were all supplied with gas for fuel and lights, but this demand was negligible as compared to the supply and no other market was available unless the large cities in the bordering States were sought. The undertaking of transporting this gas from the field to cities outside the State, was one which caused the most capable of those interested in this project to ponder long and proceed cautiously. This great gas

production found in the search for oil, attracted the attention of the Equitable Gas Company, which was then supplying the city of Pittsburgh, and it organized the Philadelphia Company of West Virginia, who acquired by purchase some of the West Virginia large gas wells and also large acreage under lease. It extended its main gathering lines to connect these large wells and transported the gas to market. The South Penn Oil Company had been the largest operator and producer of oil and as such had developed such a large gas production, and proven by its tests that a larger portion of its great lease-hold estates was rich in gas and not in oil; that so much of its invested capital had found its way into gas production, with no market, no return, and this situation was given its management much concern until it finally concluded to undertake the marketing of the gas.

In 1898 the Hope Natural Gas Company and East Ohio Gas Company were organized to find a market for this gas. Pittsburgh appeared to be well supplied at that time and no inviting market offered. Washington, Baltimore and Cleveland were considered, and finally Cleveland and intermediate cities appeared to afford the best available market. A number of these large wells were gathered into a large line from a point in Wetzel County to the Ohio river at Round Bottom, where it connected with a large line of the East Ohio Gas Company which extended from the Ohio river to Canal Dover, Urichsville, Dennison, Massillon, Canton, Akron and finally to Cleveland.

In 1900 the Reserve Gas Company was organized and acquired some large wells in the Fifth sand pool in Harrison and Lewis Counties, as well also a large acreage. It began and constructed a large line from Dry Fork in Lewis County to the Ohio river and from the Ohio river to Sugar Grove, where its gas was delivered to two large marketing and distributing companies of Ohio.

Also the Manufacturers Light & Heat Company found its way by extension of its main pipe lines down the Ohio valley into West Virginia for its portion of the State's great natural fuel. Likewise the Carnegie Steel Company, wishing to relieve the situation by using some of this very cheap fuel, got into the gas business and built lines from its plants in Pennsylvania into West Virginia gas territory.

About 1893 some large gas wells were found in Kanawha County and the Charleston Natural Gas Company was organized and transported this gas to Charleston, and later this property came into the hands of the United Fuel Gas Company, which has since developed into one of the largest gas producers in the State. After the organization of the United Fuel Gas Company, the Columbia Gas & Electric Company acquired some gas wells and territory in southern West Virginia, entered upon an active development campaign and laid a large line from that State to Cincinnati and other cities. By contract, it acquires a large part of its gas supply from the United Fuel Gas Company. However, a number of other gas producing and marketing companies were created, acquired production and supplied certain markets with natural gas, but the seven preceding named companies are the major producing and marketing gas companies in West Virginia.

Prior to 1900 the gas found in West Virginia was the result of search for oil, but from this date down to the present time, the drilling has been principally in search for natural gas. The West Virginia gas field has been so regular, solid and compact, that many sections of the State are closely spotted with wells, one to each 30 to 50 acres, and approximately 10,000 wells are now producing natural gas only, in West Virginia and no reliable estimate can be made of the number of dry holes drilled in the search for gas.

Drilling for Natural Gas

The operators lay out and construct a system of main lines designated as trunk lines and to this system are connected all of these wells by means of small lines, where the gas feeds in to their main system that transports the same to market. The gas producing counties in West Virginia are now covered with a complete net-work of pipe lines, so much so that it is very difficult for a farmer to build a residence or barn and miss a pipe line in his excavation for the foundation. The West Virginia gas producers are compelled to conduct from the time they engage in the business to date, a constant search for production and a constant construction of transportation capacity to care for the increasing demand and provide against the rapid and sure decline in their production. First, the producer must carry upon a yearly rental, millions of acres under lease. Second, he must conduct an active drilling campaign to keep up his production. Third, he must extend his gathering lines to reach his new production. Fourth, he must increase his horsepower pumping capacity to provide for the decline in rock pressures and the constant growing in the distance from the mouth of the well to market. Fifth, he must constantly care for and nurse his old wells and protect them as far as possible against their great enemy and destroyer, water.

The first large transporting pipe lines from West Virginia to market, when put in operation had the gas travel from the mouth of the well to market by means of its natural rock and there was a constant campaign waged by the operator to repair lines blown up on account of its high line pressure. Later, after the rock pressures began to show a decline, it was necessary then to develop artificial power to make up for the decline in rock. To contrast this change, we can best do so by citing what we did then and what we do now. In case of a sudden drop in the temperature, say at Cleveland, and a heavy pull on the supply, we could order our tenders to put in the line two or three of our big wells which would be sufficient to boost the pressure and supply the increased demand, but now under similar conditions, we order turned into the line from 1,000 to 1,500 wells and start up from 25 to 50 pumps.

The First Compressing Station

The first compressing station in West Virginia was built by Hope Natural Gas Company in 1903, which consisted of two 4,500 H.P. Snow Twin Engines, located at Hastings. These two engines were sufficient to care for the needs of its market until 1907 and 1908, when additional units were added. To further illustrate the change in the gas production in West Virginia, from 1903 to date, will use the case of the Hope Natural Gas Company, with substantially the same market and demand then as now, when less than 500 wells and one compressing station with two units supplied without any shortage the peak demands of its market, when

today it requires more than 6,000 wells, 42 compressing stations, with a total horsepower of 81,000.

From 1900 to 1914 the gas producers in West Virginia carried on an active drilling campaign, not alone required to keep up their demands on account of depleting wells, but to protect and save from expirations lease contracts on large acreage of gas territory. Consequently they were carrying a large gas production greatly in excess of their requirements. But from 1914 to 1919 inclusive, the new production began to decrease and the market demand during said period greatly increased on account of industrial activity, not only consuming the over production heretofore shut in, but in the winter of 1917 and 1918 there appeared a shortage of gas for peak loads, which was the first shortage recorded in West Virginia's gas supply. This shortage was not contributed by lack of activity on the part of the producers as they were continuing their usual, and in most cases, increased drilling campaign, extending lines and building additional compressing stations, but the new fields drilled did not respond in production as the old ones did and the gradual decline in volume and rock of the old wells.

A careful study of the producing gas wells in northern West Virginia shows conclusively that the average life of one of these wells is not over ten years. The heavy demands on this gas has now been standing in the neighborhood of twenty years and many thousands of these gas wells which at one time produced millions per day, have long since been abandoned by the operator for their failure to produce, and large sections of West Virginia's great gas producing territory contributes nothing to the gas supply. Therefore, a producer who has assumed the burden of supplying a market

BLUE CREEK, KANAWHA COUNTY, WEST VIRGINIA

and depends upon a certain rich gas territory for his supply, in the course of a few years, is confronted with a serious shortage, as his wells gradually decline, having lived out their average life of producing.

The Gas Situation Today

This is the situation in northern West Virginia. The majority of the old wells have lived out their average life as producers and are disappearing from the picture. The operator to meet his demands is forced to extend his lines into new territory and search for new production, and to do this, requires the expenditure of large sums of money, which has not always proven a safe investment. The failing gas production in northern West Virginia forced some of these large operators to lay from 50 to 100 miles of large pipe lines into the southern part of the State, where the production is younger in years. Taking in county for county, there are now ten drilling wells in southern West Virginia to one in northern West Virginia.

The average open flow of gas wells in northern West Virginia will show only about 100 M. cubic feet per day and they will only produce and deliver into the line about 35 M.

ANOTHER SCENE IN KANAWHA COUNTY

cubic feet per day. This is the well that the producer must depend upon today to supply his demands and the one that he must expend large sums of money caring for, nursing, fighting water, in order that it may live out its allotted time and contribute its mite to making comfortable some happy family in some far distant city.

There was a time not long ago when an operator would not save a well unless it would show one-quarter of a million cubic feet per day, but that condition has changed to the degree that all operators will now save wells that will show an open flow of only 10 M. cubic feet per day. Heretofore wells producing oil and also a few thousands feet of gas per day from the same sand, commonly called "casinghead gas" would be wasted, but now the operator is forced to expend money in laying lines to these oil wells to harness up and save this small amount of gas to help out his demands. This is the procedure through which the West Virginia operator collects his gas at the present time.

As the production of gas wells in West Virginia shows a marked decrease, a very careful study has been made of the question of securing new production from lower sands by deeper drilling, or drill-down old wells and no operator has abandoned any well until he has ascertained by deeper drilling that no additional gas could be found below, and where there is any possible chance of finding gas in lower sands, all wells are drilled in search therefor, and many other thousands of wells would have been long since consigned to the scrap heap had it not been for a small quantity of gas found in a lower sand. Almost unlimited capital has been invested in West Virginia in deep well tests and with the expenditure of all this money, no gas has been found below the well-known gas-producing sands. One West Virginia operator alone has drilled more than twenty (20) wells over 5,000 feet deep.

At the close of each year's business each large gas producer had added several hundred new producing gas

wells, laid many miles of lines and built additional compressing stations. This growing extension in property to serve the same market has been regular and continuous each year down to the present day. To further illustrate the annual growth of this extension in property, we will take the case of the Hope Natural Gas Company, showing the amount of main lines laid in the following years:

	8-in.	10-in.	12-in.	16-in.	20-in.
1920.....	17.6 mi.	10 mi.	.....	.....	.....
1921.....	4 mi.	21.3 mi.	5.1 mi.	28.5 mi.	.....
1922.....	.....	.....	.....	.....	.....
1923.....	.....	22.6 mi.	26.3 mi.	5.7 mi.	.....
1924.....	12 mi.	7.4 mi.	41 mi.	.....	15 mi.
1925.....	12 mi.	24.5 mi.	14.3 mi.	31 mi.	95.6 mi.

During this same period, the same company built 20 additional compressing stations and constantly added new units to the old stations, increasing their pumping capacity. In 1924, another producing gas company laid 50 miles of 12-inch line at one time in order to reach some needed production. The average costs of drilling and equipping gas wells in West Virginia, based upon the figures for three periods of ten years each, are as follows:

1904.....	$5,000.00
1914.....	7,000.00
1924.....	14,198.00

The percentage of increase in the cost of new wells in 1924 over 1904 was 184%, and in 1924 over 1914, 103%. The percentage of increase in wages of gas field workers in 1924 over 1914 was 73.3%. The percentages of dry holes of wells drilled are as follows:

1904.....	12.2%
1914.....	11.4%
1924.....	30.5%

The averages of initial open flow of new gas wells drilled are as follows:

1904.....	4.497 M. cu. ft. per day
1914.....	1.341 M. cu. ft. per day
1924.....	.636 M. cu. ft. per day

The average rock pressures of new gas wells are as follows:

1904.....	605 lbs.
1914.....	432 lbs.
1924.....	379 lbs.

The average rock pressures on old wells selected for annual test in each square mile are as follows:

1904.....	584 lbs.
1914.....	350 lbs.
1924.....	190 lbs.

According to the average open flow of new wells, an operator drilling 100 wells would have available in the year 1904, 449,700 M cubic feet of natural gas per day. In 1914, 134,100 M. In 1924, 63,600 M. In other words, the average gas well drilled in 1904 would produce 7.1 times more gas than the same well drilled in 1924, to say nothing of the decline in rock pressure during the same period, and the same well would cost 2.84 times less in 1904. To state it in another form, taking the increase in the cost of drilling and the decrease in volume recovered, 1,000 cubic feet of gas would cost 20.16 times more to produce in 1924 than in 1904.

From the beginning of the marketing of West Virginia gas production, it has been a continuous increase in property and equipment and moving back gradually into new territory, which requires an increase in the transportation facilities and an increase in power to collect the gas and drive it to market. This year one of the big producers in West Virginia is expending about $6,000,000 in laying some large pipe lines into the southern section of the State to acquire some additional production in order that it may meet the demands upon its supply, but not one cubic foot of gas is produced from the expenditure of this large sum of money; all of it goes into providing means of transportation, and the production of gas to fill this additional facility, must be provided from other funds. If gas could not be found in quantities and at the same rate of cost of production as in 1904, yet the added cost of increased transportation facilities would greatly increase the cost of the product at the market, but we have both factors entering into the cost of producing and marketing.

The peak of the gas production in West Virginia has gone and the operator must be content to drill for small production and collect and conserve all of the gas that can be had irrespective of the smallness of its production, in order that it may meet the demands of the consumers. In doing this, he is confronted with the following changed conditions:

First—Decline in volume of new wells.

Second—Increase in cost of new wells.

Third—Increase in transportation and gathering lines.

Fourth—Increase in compressing capacity.

Fifth—Increase in cost of labor and material.

Sixth—Increase in cost of operating stations and main lines.

Seventh—Increase in gas well royalties.

Eight—Increase in taxes.

Every item that enters into the gas producing and marketing business shows an increase, except the production, which shows a decrease.

THE INFLUENCE OF MOISTURE ON THE RATE OF MELTING AND ON THE PROPERTIES OF SODA-LIME GLASSES. A paper by Edith M. Firth, B.Sc., F. W. Hodkin, B.Sc., H. Parkin, M.Sc., and Prof. W. E. S. Turner, D.Sc., and presented at the June 2 meeting of the Society of Glass Technology by Prof. Turner, who reported the results of experiments with four series of meltings, in two of which soda was introduced wholly as soda ash, in the other two partly as saltcake. Moisture was present in amounts ranging from 0.25 to 15 per cent in different batches. In general, the presence of a limited amount of moisture had a beneficial effect on the rate of melting. In the case of batches containing no saltcake the best amount appeared to be about 1 per cent and not exceeding 2 per cent; for batches containing saltcake, 3 to 4 per cent. The glasses made from batches containing saltcake were refined more easily and were freer from waviness than those prepared from batches containing soda ash only. Glasses prepared from batches containing more than a certain proportion of moisture were found to be more viscous and to have a shorter working range than those obtained from ordinary dry batches.

TECHNICAL NEWS BULLETIN NO. 110, BUREAU OF STANDARDS. The bureau has been studying methods for the accurate measurement of the viscosities of glass between 1,300 and 925° C. and has found that consistent results can be obtained with a rotary viscometer similar to those used by previous investigators, if proper precautions are taken. In order to provide fundamental data from which it is thought the viscosity of a glass of any composition can be computed, the viscosities of a large number of glasses will be determined, beginning with the simplest glasses (soda silica) and then modifying the soda-silica glasses by adding, singly and in various combinations, the other glass-forming compounds, such as alumina, lime, magnesia, potash, and the oxides of lead, zinc, boron, and barium.

The Use of Cullet in Glass Manufacture*

By Erich Felsner

As is well known, broken glass and glass waste is not useless but can be melted again. The adding of cullet, however, should be done with caution. There are certain limits which should not be exceeded if a good glass is to be obtained. Glass made from cullet has a different composition from the original glass from which it is made. During the remelting, valuable parts are lost; especially the alkalies are volatilized. The loss amounts to from 2 to 3 per cent of the weight of the glass. If cullet is used alone, it is possible to obtain a glass approximately similar to the cullet by adding 2 to 3½ pounds of soda ash or potash for each 100 pounds of cullet. However, exactly the same glass cannot be obtained, which proves that other glass substances are lost by the melting of cullet.

With ordinary glass, this effect on the quality of the glass is without special significance. If the glass batch is well compounded, a large quantity of cullet can be added without harm. But with the higher grades of glass the addition of too great a quantity of cullet results in unsuitable glass. There are some glasses which cannot stand the addition of any cullet. These facts are not only theoretically explainable but have also been proven in practice.

It is highly advisable to add always the same quantity of cullet to those glasses which must always remain of the same composition, for instance those which must be worked further before the blast lamp, or which are going to be used for the making of cased glass. Experiments and observations made in the manufacture of thermos bottles, have shown that the bottles are free from defects as long as the addition of cullet does not exceed a definite percentage. If too much cullet is added, the glass becomes brittle and during the finishing of the bottles over the blast lamp there is always much breakage. Besides, the durability becomes less. The addition of cullet to glass used for casing is often the cause of trouble. If the glass batch is so compounded that the resulting glasses have the desired physical properties, it is found that they do not keep together, if small amounts of cullet are added. Such glasses can only be made successfully with cullet, if the batch has been modified with due regard to the amount of cullet used. Besides the glasses mentioned, there are others in which the addition of cullet is of such profound influence that a change in the quantity added to the batch may lead to failure.

Besides affecting the nature of the glass, cullet also plays an important part in the melting process. Addition of cullet may improve the melting process, but it may also affect it unfavorably. If cullet is melted alone, without the addition of any batch, it is usually difficult to obtain a good quality of glass without adding some clarifying agent. Cullet always contains impurities, especially dust and soot from the lehrs. These impurities develop gases in the molten glass which cannot escape, since there are no substances that develop carbon dioxide or oxygen by which the molten glass is stirred up, and that facilitate the escape of enclosed gases. With perfectly clean cullet, it is possible to obtain a good glass if the temperature of the furnace is correct. With impure cullet it is only possible to produce a good glass when great heat is applied; this may cause breakage of the pots. It is therefore always better to add a clarifying agent, such as arsenic, salt cake or saltpetre. These serve to stir up the molten glass and to drive out the seeds.

Very impure cullet should not be used at all. If a little of such cullet is added to a pot of glass which usually turns out well the glass will not clear up but will remain full of small blisters. Only with glass that is naturally inclined to foam, such as brown or yellow glass, this trouble does not occur.

Ignorance sometimes exists regarding the way in which cullet should be added, to improve or speed up the melting process. It often occurs that some of the pots in the furnace are less hot than the others and consequently they fall behind the others in operation. It is customary to speed up the melting process by using only cullet for the first filling. The object is to melt the cullet down quickly, so that a second addition can follow soon, in order to fill the pot rapidly, so as to begin the fining process earlier than the other pots. However, if only cullet is used, this procedure very often is not successful. The desired object can only be obtained if after the second addition of cullet there is added a small amount of salt cake, saltpetre or arsenic, and the pot is subsequently filled entirely with cullet. If this is not done, all the troubles inherent to the use of cullet make their appearance. The gas bubbles that are formed remain in the lower parts of the pot so that at the end of the melting period only a small part has escaped. The method described above is applicable only to pots that are quite cool. Sometimes it is even better to add some batch after the first addition of cullet. With regard to the cooler pots, the mistake is often made of filling them up some time before the general filling of pots in the furnace. This is not the correct practice. If a cool pot is filled very early, at a time when the bottom of the pot has not been heated sufficiently, the first addition of cullet almost invariably sticks to the bottom. It does not rise into the molten glass until late and when the furnace is allowed to cool the glass will not be entirely plained. It is advisable to heat such pots well before the first addition of cullet. If this is done, some batch can be mixed with the cullet, which has a favorable effect on the plaining process. Unless a pot is very cool, it can usually be brought in at the same time as the others by this method.

The practice of adding cullet at the end of the melting period can be applied to ordinary glasses without much effect on the quality. However, it often causes lines and waves, since usually the cullet glass is somewhat more brittle than the glass made from batch. For ordinary glass ware this is usually without much significance, but for the better grades

* *Keramische Rundschau*, Vol. 34, p. 293, (1926) Translated for GLASS INDUSTRY.

of glassware the method cannot be used. For the manufacture of homogeneous glasses, which shall become free from seeds during the fining period, it is therefore of great importance to mix the cullet with the batch in definite proportions. If this is done, a glass of even composition is the result and slight differences can be eliminated by "bubbling" the glass at least twice at the beginning of the fining period. If cullet and batch are added separately, the strongest "bubbling" often does not suffice to mix the glass layers of unequal composition. The result is usually a glass full of lines and waves.

The preceding applies of course only to normal glass. The addition of cullet is arranged differently in the manufacture of glasses which foam considerably. These have been discussed in the previous issue.[1]

[1] The Melting of Yellow Glass. Vol. 7, p. 139 (June, 1926).

The Laboratory

The Valuation of Nitrates

Sodium nitrate, also called Chili saltpetre, is found in large deposits in desert regions along the west coast of South America, especially near the boundary lines between Peru, Chili and Bolivia; the territory is chiefly owned by Chili. These deposits extend about 220 miles in length, and average 2 miles in width. The crude sodium nitrate is termed locally "caliche" and the "calicheras" are scattered over a large area. The beds are about 5 feet thick, lying near the surface but covered by a conglomerate of rock debris, cemented together by salt and gypsum. The composition of the "caliche" is variable as shown by the following analysis:[1]

ANALYSIS OF CALICHE

	I	II	III	IV
Sodium nitrate	28.54%	41.12%	22.73%	27.08%
Potassium nitrate	trace	3.43	1.65	1.34
Sodium chloride	17.20	3.58	41.90	8.59
Calcium chloride	....	....	....	5.25
Sodium sulphate	5.40	trace	0.94	none
Magnesium sulphate	3.43	10.05	3.13	none
Calcium sulphate	2.67	3.86	4.80	2.89
Insoluble matter	40.30	31.86	22.50	47.34

Since the region is rainless, and water and fuel are very scarce the greatest economy is practised in refining the crude material. The "caliche" is crushed and boiled with water in tanks heated by steam coils, until the liquor is sufficiently concentrated, when it is run off to crystallize. The mother liquor retains most of the chloride of sodium and potassium with about 20 per cent of the nitrate. The sodium nitrate crystals are drained and dried in the sun and packed and shipped as crude Chili saltpetre, containing from 94 to 96 per cent of $NaNO_3$. For glass making purposes, this is purified by recrystallization.

None of the impurities found in soda nitre are particularly harmful for the purpose of glass making. The iron content is usually low.

Potassium nitrate, usually called "nitre" has the advantage over soda nitre that it is less hygroscopic, and for this reason it is more generally used. It is made by double decomposition of sodium nitrate with potassium chloride. The reaction is as follows:

$$\underset{\text{(soda nitre)}}{NaNO_3} + \underset{\text{(chloride of potash)}}{KCl} = \underset{\text{(salt)}}{NaCl} + \underset{\text{(nitre)}}{KNO_3}$$

The solubility conditions permit the production of very pure nitre. The material is often over 99½ per cent pure. The process is carried out as follows:

[1] Clarke, Data of Geochemistry, 5th Ed. p. 256.

Commercial chloride of potash, containing about 80 per cent KCl, is dissolved in water in large tanks, heated with steam coils. When the solution has the required density, nitrate of soda is added and the boiling mixture stirred. On evaporation the common salt, being less soluble than the nitrate, is precipitated, and as much as possible of it is removed. The concentration of the solution is then continued, and while still hot, it is drawn into crystallizing tanks. Upon cooling the nitre separates out. The crystals are washed with a saturated solution of nitre to remove the mother liquor and the remaining salt. Recrystallization renders the product of great purity.

Use of Nitrates in Glass Making

The action of the nitrates of sodium and potassium is based on the formation of oxidizing gases during the melting process, as follows:

$$\underset{\text{(soda nitre)}}{2\,NaNO_3} = \underset{\text{(sodium nitrite)}}{2\,NaNO_2} + \underset{\text{(oxygen)}}{O_2}$$

$$\underset{\text{(sodium nitrite)}}{2\,NaNO_2} = \underset{\text{(sodium oxide)}}{Na_2O} + \underset{\text{(nitrogen)}}{N_2} + \underset{\text{(oxygen)}}{3O}$$

The oxygen helps to burn up any organic substances present in the batch, and has therefore the effect of a clarifier, by removing carbon and sulphur. Ferrous iron, which gives a green color to glass is oxidized to the yellow colored iron compound of higher oxygen content, the color of which is much less noticeable. The formation of gases helps to stir up the molten glass, which tends to render the product more homogeneous, at the same time removing blisters and seeds.

It is clear that the use of nitrates is not practicable when the glass is made under reducing conditions, such as in the manufacture of copper ruby, or when salt cake and coal are used.

Care should be exercised in the use of nitrates, since they have a destructive effect on the refractory materials. The fact that their use increases the amount of alkali in the final product should be taken into consideration.

Analysis of Nitrates

The following impurities may occur: NaCl, Na_2SO_4, Na_2CO_3, Fe_2O_3, Al_2O_3, CaO, MgO, SiO_2, H_2O.

It is usually sufficient to determine the impurities and moisture and to find the amount of $NaNO_3$ by difference. The direct determination of nitre is best done by the "Devarda method."

MOISTURE. Twenty grams of sample are heated at 205-210 degrees C. in an air bath or electric oven. The loss in weight multiplied by five gives the percentage of moisture.

INSOLUBLE MATTER. Ten grams are treated with hot water and filtered through a weighed perforated crucible. The residue is dried at 100 degrees C. The filtrate is saved for further determinations.

SODIUM SULPHATE. Dissolve the moisture sample (20 grams) in hot water and transfer to a porcelain dish. Evaporate several times to dryness with hydrochloric acid, to remove the nitric acid. Add 50 cc. of water and some HC1 and filter. Heat to boiling, add 10 per cent barium chloride solution, filter, ignite and weigh the barium sulphate formed.

Calculation: Weight of $BaSO_4 \times 3.0445 = \%\ Na_2SO_4$.

IRON OXIDE, ALUMINA, LIME AND MAGNESIA are determined on a 20 gram dried sample. The material is dissolved in water and treated with HC1 as described in the determination of Na_2SO_4. The silica is determined by evaporation to dryness, in the filtrate the oxides of iron and aluminum are precipitated with ammonia, and lime precipitated in the filtrate with ammonium oxalate. Magnesia is precipitated in the filtrate with ammonium oxalate. Magnesia is precipiated in the filtrate from the lime by ammonium phosphate.

SODIUM CHLORIDE. The filtrate from the insoluble residue is boiled and magnesium oxide is added until the solution is alkaline to litmus. A few drops of a one per cent potassium chromate solution is added and the solution titrated with a standard solution of silver nitrate until the appearance of a reddish color. The silver nitrate solution should be standardized against a solution of sodium chloride of known strength.

$$\textit{Calculation:}\ \frac{cc.\ N/10\ AgNO_3 \times .005846 \times 100}{\text{weight of sample}} = \%\ NaCl.$$

Mullite Content of Some of Our Commercial Blocks*

BY FRED S. THOMPSON AND HOWARD I. VORMELKER

The alumina-silica compound, mullite, has been and still is a much studied constituent of many ceramic products. Of late years it has taken an important place in the discussions and experiments of those interested in glasshouse refractories.

J. W. Rees, a member of the Society of Glass Technology, published in the 1924 December *Journal* a paper on "Alumina-silica Minerals in Glass House Pots and Tank Blocks," in which he describes his work of separating the mullite content of the various glass house refractories by means of hydrofluoric acid extraction of everything except the crystals.

Following this lead we thought it might be of interest to make the same determinations on some of the representative American tank blocks.

These blocks were obtained from stock and were designated by number. The identification numbers used in this paper are the same as those used in our previous discussion.

Our method of determining the mullite content was as follows:

> The tank block sample was crushed to a powder and quartered down to about 15 grams. A portion of this representative sample was then ground to an impalpable powder in an agate mortar; one gram of this powder was then added to 20 cc. of pure hydrofluoric acid and left for twelve hours at 20° C. The insoluble material was separated by filtration, using platinum vessels. The residue was weighed and analyzed. As the crystalline material is slowly soluble in hydrofluoric acid, the results, hereinafter described, are only approximate; but as a uniform time and temperature of exposure to the acid was adopted, the results are all comparable.

Table No. I gives all the data bearing on the determination of mullite in the blocks as they came from the kilns of the manufacturers.

TABLE No. I

	1B	2	3	4	5	6	7	8
Percentage of sample in residue (mullite)	7.00	4.53	12.78	3.9	4.09	6.54	5.5	2.82
Percentage composition of residue Al_2O_3	69.1	68.4	71.8	73.8	79.9	69.7	70.1	....
Percentage composition of residue $Si\ O_2$	29.4	29.0	26.5	23.3	27.5	26.1	27.9	....
Percentage composition of residue Fe_2O_3	1.0	2.4	1.2	1.9	2.0	4.1	1.6	....
Percentage of mullite theoretically possible.	29.3	24.8	30.7	38.5	41.2	39.3	31.65	54.3

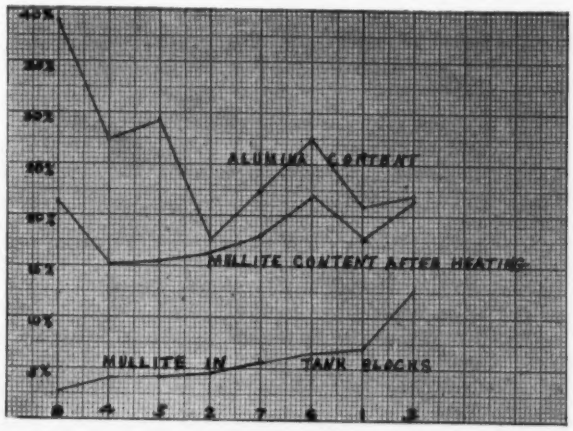
*Abstract of paper read before the annual meeting of the American Ceramic Society, Atlanta, Ga.

EFFECT OF REBURNING ON MULLITE CONTENT

About twenty-five grams of each of the original samples were quartered out and burned at 1,450°C. for twenty-four hours. This treatment produced in each case a hard vitrified body. The colors varied from brown in the case of No. 7 to black in the case of No. 6. These vitrified samples were crushed and ground and analyzed as before. Table No. II shows the results.

TABLE No. II

	1B	2	3	4	5	6	7	8
Percentage of sample in residue (mullite)	17.5	16.45	21.78	15.2	15.5	22.01	18.1	21.41
Percentage composition of residue Al_2O_3	71.9	73.1	72.3	68.2	66.3	68.4	71.1	69.4
Percentage composition of residue $Si\ O_2$	26.1	23.5	26.1	29.4	30.8	27.3	27.1	27.0
Percentage composition of residue Fe_2O_3	1.2	2.6	1.3	2.1	2.2	4.1	1.7	3.1
Percentage of mullite theoretically possible.	29.3	24.8	30.7	38.5	41.2	39.3	31.65	54.3



The curves show the facts set forth in the two tables. All attempts to reconcile mullite content with chemical composition failed. Furthermore length of service of the different makes of blocks did not appear to be proportional to the mullite content.

Fire-Clay Brick—Their Manufacture, Properties, Uses and Specifications. Circular No. 282. Bureau of Standards, Washington, D. C. Early history of the fire-clay brick industry.

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The Industrial Outlook

Despite the fact that profits and activity in industry have been at a higher level than was the case during the preceding year, there is evidence to show that the peak has been reached in the period of industrial and business expansion which began in 1921. There is the prospect of a gradual recession of business and industrial activity during the second half of this year, extending possibly into 1927. Nor is this unexpected. In every period of long-sustained expansion there has come a moment when the trend has turned downward for some time.

However, there appears to be no ground for strong pessimism. Granted that a period of recession in industry lies ahead, it is only a question as to when the tide will again go forward, to carry this country to an even greater development than we are now witnessing.

The unfavorable factors are a decrease in the building permits, which will have its effect on the structural glass industry. Manufacturers' inventories are large. There is a decline in commodity prices in general which cannot fail to affect the glass business. There is a decline in employment, with a consequent falling off of the purchasing power of the people. The unfavorable conditions in Europe, as shown by the rapid fall in the currencies of the Latin countries involved in the war, will further decrease their capacity to buy in our markets, and will give their industries a greater opportunity to undersell the home manufacturer. Early revision of the tariff is the only means to counteract an even greater influx of foreign glass than we are having at the present time.

The favorable factors are the upturn in the retail trade, ease in the money market, light mercantile inventories and the increase in the number of new enterprises, without a corresponding increase in failures. The general situation can be summarized by noting that while the industrial conditions are growing less favorable, there will be no sudden or severe decline.

Under the circumstances the word will be passed to production managers to promote greater economy. However, it should be realized that merely reducing expenses, at the cost of efficiency, is no economy. It will be no economy to neglect the repair or the installation of pyrometer equipment, needed for the supervision of tank control and management of the lehrs. It will be no economy to worry along with antiquated equipment, which requires more labor, consumes more time and gives smaller returns than the latest and best apparatus on the market. Better utilization of fuel, prevention of heat losses, improved methods of annealing, better ways of handling raw materials, these and the like are true economies. They cannot be attained without the necessary equipment, and without the men capable of using it to the best advantage.

An Old Story

Every few years the glass industry hears that it is faced with a crisis, due to the invention of some new substance having all of the advantages of glass and none of its drawbacks. The industry is informed that the new substance is less costly than glass, that it does not require any heat to produce

it, that it will revolutionize the glass industry and that it will vitally affect our civilization.

Such discussions were heard twenty years ago when bakelite was first introduced. As is well known, this substance has found many important uses, and has become a source of wealth to its inventor and his associates. However, its effect on the glass industry has been practically nil.

During the past few months there have been glowing reports in the daily and technical press concerning the invention of a new flexible glass. As one technical journal puts it:

"A new type of window glass which is of organic origin is being made in England. This new glass is said to be transparent, colorless, flexible, resilient, breaks without splintering, is half the weight of ordinary glass, non-inflammable and stronger than cellulose. It is proposed that this material be used for automobiles, certain classes of glass containers, in the electrical trade and elsewhere.

"The process is shrouded in secrecy and very little information is at all available. However, if the claims that have been made for this product are true, it will undoubtedly revolutionize certain branches of the glass industry and affect manufacturers vitally."

Concerning this new glass, another journal has this to say:

"The new malleable glass is said to be non-splinterable, ten times clearer than ordinary glass, and easily bent. A ball of the substance, when dropped on the floor will bounce better than a golf ball. It will absorb any kind of dye, and delicate vegetable dyes can be used to color it. It can be made into imitation meerschaum pipes, cigar holders, fancy umbrella handles and door knobs. In many instances it can be used in place of rubber or vulcanite. Its uses as suitable material for automobile windshields seem apparent. One valuable property of this glass is that it will transmit the ultraviolet ray and therefore can be used as a shelter for patients requiring sun treatment—also for greenhouses."

Another publication states:

"Applied to motor-car windows and windscreens the new material would have the transparency, whiteness and durability of glass with a degree of flexibility that removes all dangers from splinters and jagged fractures.

"If these claims are true a new era may be dawning in the glass industry. The millenium is not yet. This is only one step, but a fairly long one, apparently. The possibilities seem many."

What are the facts?

The substance, so enthusiastically acclaimed as a new invention, is an organic condensation product of carbamide-formaldehyde. In its chemical composition it does not differ basically from its nearest relative bakelite, which has all the properties claimed for the new substance. The principal difference in composition is the substitution of phenol by carbamide. However, since carbamide is more expensive than phenol, the invention will hardly cause a great deal of worry to the bakelite concern, much less to the glass industry.

We venture the opinion that the substance will find some applications. It is certain that its promotors have made admirable use of the press to obtain an amount of free publicity that would make a theatrical press agent green with envy. We wish the stockholders in the new enterprise every success. But the glass industry can afford to view the event with perfect equanimity.

Technical Consultation Service

Batches for Opal Glass

QUESTION 96. Please give us a batch for opal glass, using fluorides and also one without fluorides.

ANSWER: The following batches should be tried on a small scale, in order to see if they are suitable for the purpose for which they are required:

Opal with fluorides:

Sand	100
Cryolite	13.5
Soda ash	36
Feldspar	26.5
Fluorspar	23.5
Nitrate of Potash	3.5
Zinc oxide	8.5
Borax	4
Red Lead	2
Manganese	¾

Opal without fluorides:

Sand	100
Pearl ash	10
Soda ash	22
Bone ash	15
Lime	5
Salt	3
Red Lead	4
Arsenic	¼

Determining Copper and Nickel in Glass

QUESTION 95—Can you give us a rapid and accurate method to determine small amounts of copper and nickel in glass?

ANSWER; The following method has been used with success: Weigh out a ten gram sample into a platinum dish and add 20 cc. of sulphuric acid, 1:1, and about thirty cc. of hydrofluoric acid. Heat on a sandbath and add more hydrofluoric acid if needed, until the sample is completely dissolved. Evaporate down to fumes of sulphuric acid allow to cool somewhat and add water. Boil and filter, if necessary, into a 400 cc. beaker, and bring the volume to about 200 cc.

Put a ring of pure aluminum in the beaker and boil for about one half hour, keeping the volume constant by addition of water from time to time. The copper is precipitated on the ring as metallic copper. Filter the solution into a 600 cc. beaker, wash the sides of the beaker and the ring with a 2 per cent solution of sulphuric acid, saturated with hydrogen sulphide. This loosens the copper from the ring, which should appear bright when removed. The filtrate is preserved for the determination of nickel.

The copper is dissolved in hot dilute nitric acid. Ammonia is added until the blue copper color becomes visible. The solution is then carefully neutralized with nitric acid, and 5 cc. sulphuric acid, 1:1 is added. The copper is then determined by electrolysis.

To the filtrate from the copper, containing the nickel add five grams of tartaric acid, make slightly ammoniacal and add 20 cc. of a solution of dimethylglyoxime in alcohol. This will precipitate very small amounts of nickel. By this method one part of nickel may be detected in 400,000 parts of water. It is recommended to add a few drops of acetic acid to the solution.

Allow to stand about an hour and filter, wash with hot water and dissolve the red precipitate in hot hydrochloric acid. Make ammoniacal and reprecipitate in the presence of a little tartaric acid, as described. The precipitate may now be filtered on a Gooch perforated crucible or may be filtered on paper and burned to nickel oxide at a low heat.

Factors: $NiC_8H_{14}N_4O_4 \times 0.2032 = Ni$;
$NiO \times 0.7858 = Ni$.

Shopping Around

By K. H. Taylor

Purchasing agents are reputed to be notorious "shoppers." In this article, abstracted by *The Purchasing Agent* from an address by the author before the American Supply & Machinery Manufacturers Association, a purchasing agent of wide

K. H. TAYLOR
General Purchasing Agent, Illinois Glass Co., Alton, Ill.

experience, controlling the purchases of a large glass corporation operating several plants, analyzes the charge from a practical and commonsense viewpoint. Mr. Taylor's opinions are interesting and important, and they are stamped with the authority of extensive experience and wide knowledge in the field of industrial buying.

IS it economical purchasing for a large concern to go "shopping around"? This is a question affording numerous openings for "ifs," "ands" and "buts." The basis of the answer must be dependent largely upon the character and quantity of the proposed purchase.

In the purchase of raw materials or supplies upon a large scale or for continuous consumption; in the investment of money in machinery and equipment; in plans for changes in or the expansion of manufacturing operations, not only is it economy but the part of wisdom to thoroughly cover all sources of supply.

This does not necessarily imply a purchase from the lowest bidder. All the factors of quality, adaptability, guarantee of uniformity and performance, service and delivery, must be figured in with the price. "Shopping around," thoroughly combing all possible fields or sources, in such instances is not only justifiable but good business. From the results obtained a digest can be made, all the elements of chance and circumstances weighed in the balance, and the purchase determined upon with the sense that no one or nothing has been overlooked in the decision.

In the purchase of miscellaneous goods and supplies for general use around large manufacturing plants, the custom frequently obtains of standardizing upon certain items and contracting for requirements over a period of time. This usually follows upon a process of trial and elimination of numerous competitive goods in the same line. It does not necessarily mean placing the business exclusively with some one concern, but adopting a brand or a make that has met with the approval of the plant users and to which they have become accustomed. In this sense, it pays to "shop around" until some definite determination is reached and acted upon.

Now we come to the general situation of buying, where the "for" and "against" value of "shopping around" is open for differences of opinion.

The railroad practice, I have been told, is to broadcast inquiries for prices to every possible source of supply on each and every item of needs, large or small in number, and quantity of items. There is little or no degree of sentiment or preference involved and the price is usually the sole factor.

This may result in a quality of materials or supplies notoriously cheap but regarded as good enough. Perhaps this is good policy from the railroad point of view, but its value appears open to question. Knowing that the inquiry has been broadcast, the responses quoting are often perfunctory, no especial interest is shown or effort made to get the business, and in some instances the inquiry is ignored and finds its way to the waste basket.

A similar method of broadcasting inquiries is said to be followed by the United States Government departments and the big mail order houses.

Should you have occasion to complain of the quality or finish of what you buy, it is safe to assume that the goods were made and sold on a strictly competitive basis. This is one extreme of "shopping around" and I do not regard it favorably for large corporations.

Send out your far-flung inquiries for prices upon anything and everything to Tom, Dick and Harry, into the realm of the price cutter—the price cutter whose stock in trade it is safe to say is likely to consist of inferior goods or it could not be sold at cut prices. Make a practice of placing your business at cut prices, wherever you can get them, and you aid and abet the chronic disturber of business.

The price cutter pulls down the standard of his goods, and would take his competitors with him. Who benefits by price cutting? No one! The cut price seller cannot make the reasonable profit he must make to exist and continue in business, and the buyer may soon find himself stocked with questionable quality goods. No manufacturer can keep up the standards he should and may want to maintain, in the face of persistently cut prices. He must use cheaper materials and cut down wages.

Send out your inquiries and buy on price alone and you establish your own reputation in the trade as a buyer of cheap goods. This reputation will reflect upon your business judgment and classify you as an undesirable customer among those who insist upon a fair profit or no sale in marketing their products. You get only what you pay for. No one can or will sell you a Rolls-Royce at the price of a Ford.

The other extreme of "shopping around" would be not to shop at all but to confine the purchase of certain goods to certain favored sources and let the rest of the world go by. Situations vary and circumstances alter cases in this regard. They will depend in large measure upon who you are and with whom you are dealing.

There are instances, and perhaps many of them, in the relation of buyer and seller, where continued experience with and use of certain materials has led to one exclusive source of supply to the permanent advantage of both parties in interest, no attempt being made to place the business upon a "shopping around" basis. A bulwark of confidence is built not easily shattered, founded upon the experience of years of service in furnishing satisfactory goods at an agreed upon price. This is an exceptional and ideal relationship, one to be appreciated and cultivated. When such arrangements have been time-tried and fire-tested, they are a consummation devoutly to be wished and will aid in hastening the approach of the millennium.

In the ordinary run of miscellaneous purchase, however, such an evidence of mutual confidence and esteem is hardly feasible. It would make a very nice proposition for the recipient of the orders, who naturally would be duly appreciative and might save the buyer a lot of work and detail. It might, however, go further than this with the buyer, by throwing him out of touch with the markets, leaving him open to being charged too much and killing the interest of competitors in endeavoring to get some of his business. Some one else at some time may have something equally good to offer at a lower price, or something of superior merit at as good a price, but the fact remains unknown because an opportunity is not given to submit it.

There is another type of buyer, as I have heard of him, who thinks it pays to shop around among the salesmen who call upon him—the buyer whose slogan is: "Your price is too high." Whatever may be offered him at whatever price, it is too high. Not for long does he remain in obscurity. His reputation catches up with and precedes him. Soon is it known that a first price will not sell him, and figures are named with the expectation of a cut if necessary and that will admit it. Thus he evidences his shrewdness in the conceit of having beaten down the first price offered. Is this shopping around to advantage? The question is already answered.

Between these various extremes is a golden mean—a golden mean that can be established and maintained by corporations, large or small, which will prove by experience very much to their advantage.

In certain lines of manufacture and distribution there are certain well-established, responsible manufacturers and dealers. Confine your inquiries and orders principally to them, enough of them to secure the lowest prices, the best goods and assured deliveries, and in the long run you will buy to the best advantage.

A shell loaded with bird-shot when fired from a gun will scatter further than one loaded with buck-shot, but will not make the impression nor the penetration. A steady run of business placed with a limited number of shippers will result in a greater volume for them, and this volume will bring not only lower prices but an interest in making them secure the orders. It will go beyond this in establishing connections that know what you want and how it is wanted, and will seek to cater to these wants. It will result in the formation of personal friendships that will carry you through emergencies and give you a "first preferred" standing when goods are scarce or in heavy demand.

It is just as important that you know those with whom you deal as it is to know those to whom you sell. The wisdom of this assertion was brought home to numerous buyers by their experiences through the years of the World War, when the strength of their connections brought goods and service, that except for the personal friendships based upon years of association, would otherwise in many instances have been unobtainable.

In a talk I had occasion to make a year or two after the close of the war, I made the statement that during that great period of stress in manufacturing conditions, none of the plants of the Illinois Glass Company lost an hour of time or a dollar in production for lack of any essential item of materials and supplies. I thought this a nice thing to be able to say, and it was, but it produced more of a sensation than anticipated. Many of the hearers regarded it as so unusual and broad a statement as to incline them to incredulity. It was but a true illustration and confirmation of the tie that binds business built upon the personal touch of long associated relations and friendships.

The *summum bonum* of all this is: Build up your friendships with those from whom you buy as you do with those to whom you sell, and the desirability of "shopping around" will be limited to known and reliable sources of supply, where the price, goods and service will be all to your advantage.

Finds Glassmakers Reluctant to Discuss Costs

In a paper discussing "Opportunities in the Industrial Field" for lime manufacturers, presented by L. B. Burt, manager of the industrial department of the National Lime Association at the organization's annual meeting in June, the author, after referring to the use of lime in various industries, said:

"The subject of lime in glassmaking is best discussed 'in lodge.' To drag a glassmaster out into the open for a frank discussion of costs is a job in itself. To find one that will admit there are other cost factors entering into it than lime vs. limestone is another job. But this much is certain: while they will not concede a thing about the importance of color, yield, fuel, or control, a regular campaign insisting upon those claims cannot fail to bring returns."

Sidewalk, Floor and Roof Lights Standardized

The Division of Simplified Practice of the Department of Commerce, Washington, D. C., is constantly urging the adoption of simplification in all industries. In fifty-five investigations in which simplification of products was completed it was found that "80 per cent of the business was done in 20 per cent of the varieties offered."

Manufacturers and distributors in various lines who are now observing the recommendations of the Department of Commerce find that it pays to advertise the availability of a simplified line.

The results of one of the most recently completed investigations is summarized in Simplified Practice Recommendations No. 49, covering sidewalk, floor and roof lights, and sold by the Superintendent of Documents, Washington, D. C., at 5 cents a copy.

A committee representing glass manufacturers, architects, builders, various associations and others interested, met last November and accepted the Bureau of Standards recommendations, agreeing to make them effective March 1, 1926. This action was based upon a survey which disclosed that the industry was carrying 80 styles, 120 sizes, and 10 shapes of glass, and that 90 per cent of all normal requirements could be met by 10 per cent of that number.

The approved stock sizes and shapes are as follows:

SIDEWALK LIGHTS.—Round glass, 2¾ in. and 3 in. dia., ¾ in. thick at supporting edge, shield, 3¼ in. dia., distance on centers, 4¼ in. Square glass, 3½ in. x 3½ in., ¾ in. thick, shield, 4 in., distance on centers, 5 in.

FLOOR LIGHTS.—Square glass, 4 in. x 4 in., 1 in. thick, no shield, 5 in. on centers. 6⅛ in. x 6⅛ in., 1 in. thick, no shield, 7½ in. on centers. 3½ in. x 3½ in., ¾ in. thick, shield 4 in., 5 in. on centers.

ROOF LIGHTS.—Square glass, 8¼ in. x 8¼ in., ½ in. thick, shield 8¾ in. x 8¾ in., 9⅝ in. on centers.

Refractory Recommendations

At the annual meeting of the American Society for Testing Materials held at Atlantic City, June 21 to 25, Committee C-8 on Refractories reported that during the past year three general meetings had been held, one with the American Ceramic Society at Atlanta, Ga. The committee recommends in the Standard Definitions for Clay Refractories (C 27-20)* the deletion of references to the test for linear contraction or expansion.

The committee makes this recommendation for the following reasons:

In the Standard Definitions of Clay Refractories (C 27-20), allowable permanent linear expansion upon reheating at 1400° C. for five hours is limited to a maximum of 1 per cent for high, intermediate and low heat duty. At the time these definitions were first proposed, it was thought that a definite relation existed between expansion and other properties such as low refractoriness and deformation under load because of the assumption that expansion was brought about by the formation of vesicular structure.

It is now known that expansion is influenced by a number of physical factors, such as degree of burning, fineness of grinding, density, etc., and also that it may occur as "secondary" expansion with brick containing clays of the highest quality. Expansion of the latter kind is influenced by the rate of heating during the test and by the application of a slight load at the time of testing. With a load of 1.4 lb. per sq. in., brick may show normal behavior which would otherwise expand by as much as 3.5 per cent on a linear basis. In fact, the amount of expansion is influenced by the method of placing in the test kiln, brick on end expanding considerably less than those laid flat. This "secondary" expansion is found on a considerable percentage of the first quality fire-clay brick manufactured in this country. In view of these facts, it appears that the expansion limits are undesirable and should be deleted.

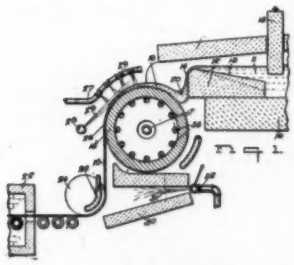
* 1924 Book of A. S. T. M. Standards.

Recent Patents

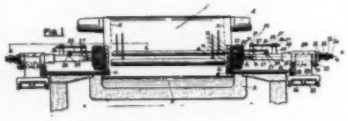
NEW INVENTIONS DESIGNED TO IMPROVE GLASS AND THE MEANS OF PRODUCING IT

Complete copies of U. S. Patent Specifications may be obtained from the Commissioner of Patents, Washington, D. C. Price 10c each

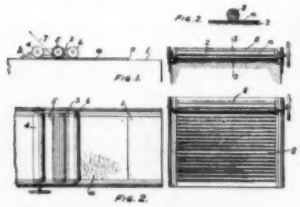
METHOD AND APPARATUS FOR PRODUCING SHEET GLASS. U. S. 1,586,187. May 25, 1926. Enoch T. Ferngren, Toledo, O., assignor to the Libbey-Owens Sheet Glass Co. Filed 1/2/25. In sheet glass apparatus, a furnace containing a mass of molten glass, a rotatable drum, means for permitting glass to flow from the furnace upon said drum, and means to draw sheet therefrom, the flow being deposited on the drum in a manner that there will be movement of the glass in two directions, in one direction with the rotation of said drum, and in the second direction opposite to the rotation thereof, said glass being controlled so that it leaves the drum in one direction only.



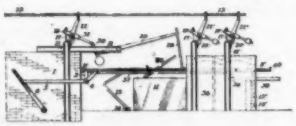
METHOD AND APPARATUS FOR DRAWING SHEET GLASS. U. S. 1,586,618. June 1, 1926. Enoch T. Ferngren, Toledo, O., assignor to the Libbey-Owens Sheet Glass Co. Filed 7/7/22. In the continuous drawing of sheet glass vertically, that procedure which consists in clutching the opposite edges of the sheet with horizontally movable and elastically adjusting stretching devices which at their respective contact points with the glass are so related therewith as to permit vertical movement of the said edges in the line of draw.



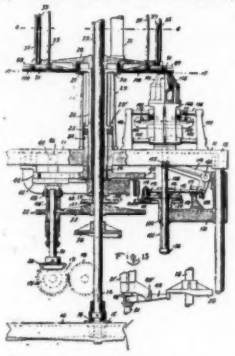
PROCESS OF MAKING CORRUGATED WIRE GLASS. U. S. 1,585,607. May 18, 1926. Walter Cox and Arno Shuman, of Philadelphia, Pa., assignors to Pennsylvania Wire Glass Company. Filed 8/7/20. The principal object of the present invention is to provide an expeditious, simple and comparatively inexpensive process of making sheets of corrugated wire glass of relatively large size and good quality. The process of making corrugated wire glass consists in rolling a flat sheet of glass with flat wire mesh embedded therein, and while the interior portion of said sheet is sufficiently plastic by heat to permit the twists of the mesh to stretch and while the exterior of the sheet is sufficiently solid by cooling upon bending to retain its form, corrugating said sheet and mesh at one operation.



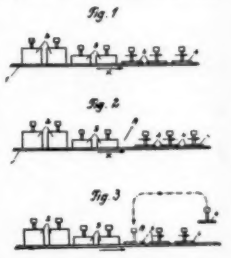
METHOD OF AND APPARATUS FOR HANDLING GLASS. U. S. 1,586,091. May 25, 1926. Charles W. Kurtz, of Pittsburgh, Orah M. Byers, of Kane, Louis R. Schmertz, of Ligonier, and Lawrence A. Gessner, of Jeannette, Pa., assignors to Window Glass Machine Company. Filed 5/1/22. In a glass handling apparatus, an interrupted glass-carrying means, a lehr through which one section of said means passes, a heating chamber through which another section of said means passes, and means between the lehr and heating chamber for automatically dipping the glass carried by said means, all of said means being operable in timed relation.



AUTOMATIC GLASS BLOWING MACHINE. U. S. 1,587,466. June 1, 1926. Carl A. Brown, of East Cleveland, and Andreas C. Nielsen, of Cleveland, Ohio, assignors to General Electric Company. Filed 4/23/24. In an automatic machine for making glass articles, the combination of a substantially horizontally disposed carrier, a substantially vertically disposed guide attached to said carrier, a head slidably mounted on said guide and comprising means for receiving and retaining the end of a glass tube, means independent of said guide and of said carrier for supporting said head and for allowing it to periodically lower along said guide, means positioned to engage another portion of said tube and to allow substantially vertical movement of said tube therethrough, and heating and molding means.



PROCESS OF GRINDING AND POLISHING GLASS PLATES. U. S. 1,582,808. Apr. 27, 1926. Lambert von Reis, Herzogenrath, Germany. Filed 7/14/25. The process of grinding and polishing glass plates passing beneath a series of grinding and polishing appliances arranged in succession to one another, which consists in imparting to the polishing appliances a movement in the direction of the feed of the glass so as to cause a vacant space to be at intervals formed between the foremost grinding appliance and the rearmost polishing appliance, lifting the foremost polishing appliance from the glass, providing it with clean felts, carrying it rearwards over the succeeding polishing appliances and lowering it into operative position in the said vacant space so as to prevent any interruption of the polishing operation.



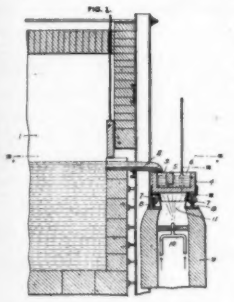
PROCESS OF ANNEALING GLASS. U. S. 1,585,542. May 18, 1926. Kenneth M. Henry, of San Francisco, Cal., assignor to Illinois-Pacific Glass Company. Filed 11/25/24. A process of annealing glass articles in a lehr or the like, which consists of first bringing the glassware to a temperature of approximately 930 degrees Fahrenheit, maintaining this temperature for a period of approximately twelve minutes, lowering the temperature rapidly to approximately 875 degrees Fahrenheit, maintaining this latter temperature for a period of approximately fifteen minutes, and thereafter reducing the temperature at approximately the following rates: 2 degrees per minute for twenty minutes; 5 degrees per minute for the next seventeen minutes; and 10 degrees per minute for the ensuing twenty-five minutes.

APPARATUS FOR COATING WITH GLASS OR ENAMEL. U. S. 1,585,990. May 25, 1926. Eli K. Houghton, Los Angeles, Cal. Filed 10/29/24. The invention primarily consists of directing an air stream which carries a comminuted or powdered fusible material, of which the coating is to be formed, and directing a flame into the air stream so that the particles of the coating material are fused while being projected against the surface.

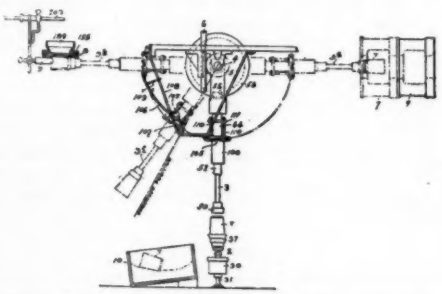
GLASS PROTECTOR FOR REFLECTORS. U. S. 1,583,269. May 4, 1926. Filed 11/11/23. Blasius Bart, East Orange, N. J. A parabolic reflector with glass guard for same, fabricated to form a single unitary article.

METHOD OF MARKING GLASS. U. S. 1,585,555. May 18, 1926. Abdul A. Mansurzadah, Oakland, Cal. Filed 7/23/25. A method of marking glass and the like consisting of chemically modifying the hydroscopic properties of a portion of the surface thereof by applying thereto a chemical agent containing chromium in solution with means rendering the chromium more applicable to such surface, and thereafter treating the same in a manner causing the agent to react chemically with certain of the glass constituents to modify the hydroscopic properties of the treated surface.

MANUFACTURE OF SHEET GLASS. U. S. 1,584,768. May 18, 1926. Charles Henry Harding, Fort Smith, Ark. Filed 2/8/26. The method of manufacture of sheet glass which consists in supplying molten glass to a receptacle and drawing the sheet upwardly therefrom, and during the drawing operation causing the opposite edges of the sheet in alternation to make and break contact with the opposite walls of the receptacle; thereby improving the operation of drawing glass in sheet form from a bath of molten glass so as to produce glass sheets or plates which are uniform in thickness, and in width as well and having uniform optical qualities.

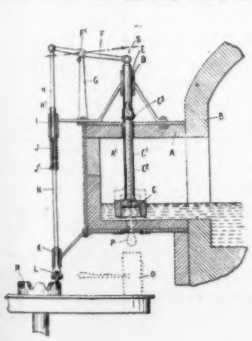


MACHINE FOR FINISHING GLASSWARE. U. S. 1,581,552. Apr. 20, 1926. Noah Thomas Edgar Skinner and Andrew J. Sanford, of Newark, Ohio, assignors to A. H. Heisey & Co. Filed 5/6/22. Apparatus for fire-polishing and finishing glassware comprising a punty-carrying arm oscillable on a horizontal axis, a fire-polishing furnace and a finishing device disposed on opposite sides of the axis of rotation of said arm, a ware-attaching device disposed below the said axis of rotation, fluid pressure means for swinging

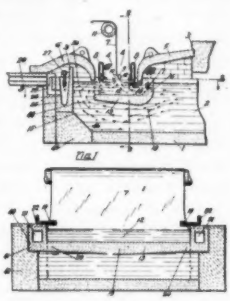


said punty arm successively from a vertical position above said ware-attaching device, upwardly to a horizontal position adjacent to said fire-polishing furnace, thence downwardly through an angle of 180° to a horizontal position adjacent to said finishing device, and thence down to a vertical position above said ware-attaching device, and automatically operable means for detaching the finished ware from said punty while said arm is swinging down from said finishing device to said ware-attaching device.

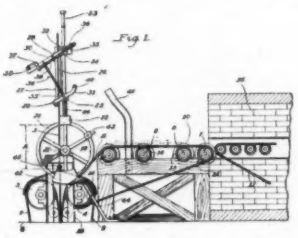
APPARATUS FOR CONTROLLING THE DELIVERY OF GLASS FROM FURNACES TO MOLDS AND THE LIKE. U. S. 1,586,704. June 1, 1926. James Dennis Roots, London, England. Filed 9/25/20. An apparatus for delivering glass from an aperture in a receptacle comprising a plunger having a rod with a passage therethrough and an enlarged head provided in its under surface with a recess communicating with the passage in the rod, said enlarged head being positioned over the aperture in the receptacle and its lower edge being immersed in the glass at all times, means for reciprocating the plunger, said means limiting the downward movement of the plunger.



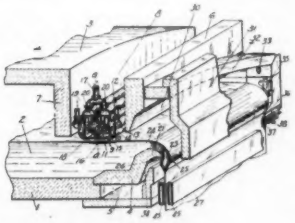
METHOD AND APPARATUS FOR SUPPLYING MOLTEN GLASS TO SHEET DRAWING MACHINES. U. S. 1,586,619. June 1, 1926. Enoch T. Ferngren, Toledo, O., assignor to the Libbey-Owens Sheet Glass Co. Filed 10/12/22. In an apparatus for drawing sheet glass, the combination with a tank containing a pool of molten glass, the tank being in open communication at one end with a supply of molten glass and closed at the other end, a transverse area of the upper surface of the pool adjacent to but spaced from the closed end of the tank being exposed, and the remainder of the pool surface being enclosed, and a machine for drawing a sheet of glass upwardly from the exposed surface of the pool, of a refractory plate submerged below the pool surface, with its upper face substantially parallel to and coextensive with the exposed area, the plate having a substantially flat upper surface but being thicker at the center than at the ends adjacent the sides of the tank, for the purpose described.



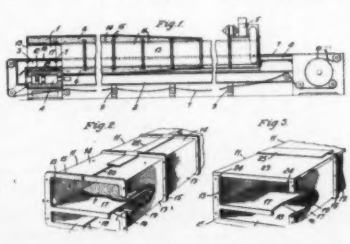
APPARATUS FOR HANDLING GLASS SHEETS. U. S. 1,587,549. June 8, 1926. William Owen, Pittsburgh, Pa., assignor to Pittsburgh Plate Glass Co. Filed 2/16/24. The combination with a vertical drawing machine for drawing a continuous sheet or ribbon of glass, of a driven carrier, a transfer frame pivoted adjacent the level of the carrier between the end of the carrier and the line of draw, so that in one position it extends upwardly along such line of draw in proximity thereto and in its other position, it extends laterally overlapping the carrier.



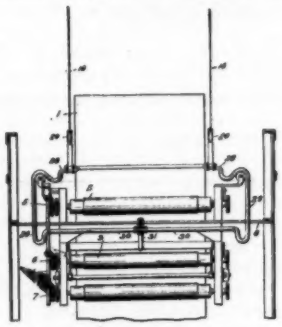
METHOD AND APPARATUS FOR CONTINUOUSLY DRAWING SHEET GLASS. U. S. 1,586,620. June 1, 1926. Enoch T. Ferngren, Toledo, O., assignor to the Libbey-Owens Sheet Glass Co. Filed 10/11/22. The method of drawing a sheet of glass in a general downward direction from an overflow lip without impairing the quality of the glass, which consists in making the surface of the glass adjacent the lip sufficiently cohesive to permit its response to the drawing action as a single unit moving in plane formation, in holding back and simultaneously controlling the quantitative discharge of the fluid glass beneath the said surface layer with a freely adjustable lip tile.



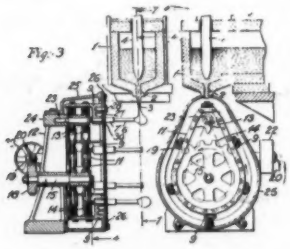
APPARATUS FOR ANNEALING GLASSWARE. U. S. 1,588,905. June 15, 1926. Karl E. Peiler, West Hartford, Conn., assignor to Hartford-Empire Co. Filed 11/2/25. An object of the invention is to provide a lehr that may be quickly and easily assembled from a plurality of substantially similar cast metal sections which, when secured together in end-to-end relation, provide a very rigid and self-supporting structure having substantially gas-tight joints between the several sections. Each section of which is provided with means for permitting certain portions thereof to move relative to each other with changes in temperature.



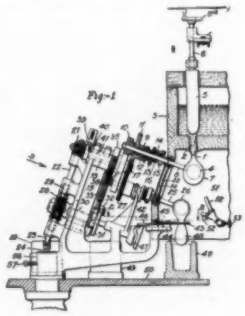
APPARATUS FOR SEVERING GLASS SHEETS. U. S. 1,587,547. June 8, 1926. Travis Oakes, Mount Vernon, O., assignor to Pittsburgh Plate Glass Co. Filed 11/25/25. An apparatus for separating sections from a continuously formed sheet of glass, comprising electric heating means extending transversely of the sheet, but of less length than the width of the sheet, means for clamping the heating means against the sheet so that it moves along with the sheet during the heating operation, a nozzle at the edge of the sheet supported in fixed relation to the heating means, so as to move along therewith, fluid supply means therefor, and means for controlling the flow of fluid through said supply means.



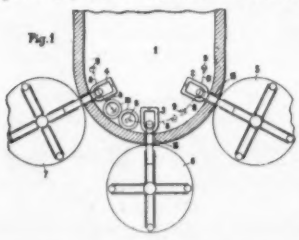
MULTIPLE GLASS FEEDER. U. S. 1,587,986. June 8, 1926. Karl E. Peiler, West Hartford, Conn., Assignor to Hartford-Empire Co. Filed 3/31/21. The invention embodies among other things a plurality of gathering implements mounted for translatory movement upon a continuously traveling carrier which successively presents each of the implements to a supply of glass, arrests its translatory movement while obtaining a charge therefrom, moves it away from the supply to segregate its charge, at the same time bringing the next implement into gathering position, and then carries the first implement to a convenient position for removal, or for presentation of its gather to other mechanism for further treatment.



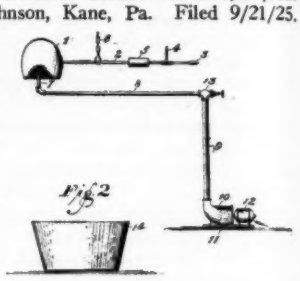
FEEDING MOLD CHARGES OF MOLTEN GLASS. U. S. 1,587,985. June 8, 1926. Karl E. Peiler, West Hartford, Conn., assignor to Hartford-Empire Co. Filed 3/31/21. In apparatus for feeding molten glass, the combination of a carrier, a plurality of gathering implements mounted side by side thereon, means for revolving the carrier to successively position each gathering implement in contact with a supply of molten glass to obtain a gather of glass therefrom, and then position the charged implement out of contact with the supply at a discharging position for delivering a mold charge from its gather, and means for rotating each implement when in contact with the supply.



REMOVAL OF GLASS FROM GLASS FURNACES. U. S. 1,589,337. June 15, 1926. Heinrich Severin, Sasbach, near Achern, Baden, Germany. Filed 9/25/25. A method of withdrawing glass directly from a glass furnace having definite dipping chambers for the mold, consisting in this that the mold is inserted into the molten glass at the dipping chamber and the glass adhering to the mold, when the latter is withdrawn, is cut off and thrown into the molten glass contained in the furnace alternately to the right and left of the dipping chamber, as set forth.



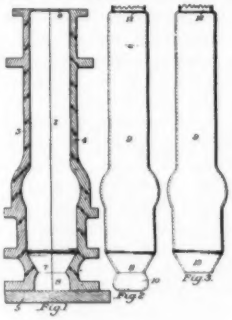
PROCESS OF MANUFACTURING WINDOW GLASS. U. S. 1,588,583. June 15, 1926. Carl J. E. Johnson, Kane, Pa. Filed 9/21/25. The process of handling molten glass in a ladle employed for conveying the glass from the furnace, said process comprising the dipping of the ladle into water, and then the delivering into the interior of the ladle a blast of air for drying and cleaning said interior prior to the reception of another charge of molten glass.



LENS GRINDING AND POLISHING MACHINE. U. S. 1,569,194. Jan. 12, 1926. Eli Maynard Long, Geneva, N. Y., assignor, by mesne assignments, to the Standard Optical Co. Filed 8/2/21. Refers more particularly to the driving mechanism for the lap and lens-holding device and to the means for adjusting the lens-holder and holding it in its adjusted position.

GLASS-SURFACING CAR OR TABLE. U. S. 1,583,785. May 11, 1926. Albert E. Evans, Pittsburgh, Pa. Pittsburgh Plate Glass Co. Filed 1/22/24. Improved means for leveling up cars or tables employed in a straight away plate glass surfacing operation and means for insuring the continuous and adequate lubrication of the wheel of the cars or table.

METHOD OF MAKING MOLD-BLOWN GLASS ARTICLES. U. S. 1,588,852. June 15, 1926. Thomas A. Nilan, Hurricane, W. Va. Filed 8/23/24. I have found that in the making of mold-blown glass articles such as lamp chimneys, the lehr annealing may be done away with if an opening other than the blow opening is formed in the mold-blown article and heat is thereafter applied to the article. Preferably, the article is blown with a portion adapted to be severed and leave an opening in the article. Heat is then applied adjacent the opening, thus permitting equalization of the temperature of the inside and outside of the article.



ART GLASS AND METHOD OF MAKING THE SAME. U. S. 1,583,441. May 4, 1926. William Blenko, Milton, W. Va. Filed 2/26/24. The method of making art glass which includes blowing glass in a mold to form a glass vessel, the walls of the mold being unpolished, withdrawing the vessel from the mold, and, without further blowing of the vessel, flattening a portion thereof into a generally plane sheet, and producing an antique finish of unusual quality.

SILVER-GLASS-MIRROR MAKING. U. S. 1,588,510. June 15, 1926. William S. Wear, Excelsior Springs, Mo. Filed 8/5/23. A method of silvering glass consisting in cleaning the surface of the glass, applying a solution of tin chloride to the cleaned surface, washing the surface with hot water to remove excess chloride solution, mixing and applying a solution to the surface thus treated while said surface is wet, said solution having a proportion of 10 ounces of cold water, 4 ounces of hot water, and 4 ounces of a solution formed of 2 ounces of Rochelle salts and 16 ounces of water, mixed with 1 ounce of a solution containing 8 ounces of silver nitrate and 6 ounces of 28 per cent concentrate of ammonia, permitting the solution thus applied to remain on the surface a predetermined length of time, then applying a hot solution containing 1 pint of water, 2 ounces of a solution formed of 16 ounces of distilled water mixed with 2 ounces of Rochelle salts and ¼ ounce of an additional solution formed of 8 ounces of Silver nitrate mixed with 6 ounces of 28 per cent concentrate of ammonia, and subsequently cleaning the surface of the glass and permitting the same to dry.

The Glass World and What It Is Doing

News of the Industry

Cost of Salt Cake Rises

Glass manufacturers who use salt cake in their melting operations are facing the unpleasant prospect of paying higher prices than those prevailing recently for that commodity. The amount of the increase, in the opinion of men close to the chemical trade and qualified to judge, is likely to run from one to two dollars a ton, to be added as contracts expire and come up for renewal. In some cases, it is intimated, old customers will be taken care of on a mutually satisfactory basis until the end of the year.

Salt cake is made from common salt and sulphuric acid. Although some sulphuric acid is made from pyrite, most of it is being made from sulphur. An increase in the cost of sulphur, therefore, affects the glass manufacturer indirectly, but nevertheless seriously.

The impending rise in the price of salt cake is attributed by salt cake producers to unusual conditions in the sulphur industry.

In the process of making a ton of salt cake, as carried on by several of the large manufacturers, there is required about 300 pounds of sulphur. For many years, over 99 per cent of this country's sulphur supply has been produced from the mines of three concerns—the Union Sulphur Company, with immense deposits in Louisiana; the Texas Gulf Sulphur Company, of Gulf, Tex., and the Freeport Sulphur Company of Texas at Bryan Mound.

In the Louisiana and Texas mines the deposits of sulphur occur hundreds of feet below the earth's surface, with vast quantities of unconsolidated sands and mud and in some places as much as 100 feet of limestone, known as cap rock, overlying them. Above at least one mine, deep deposits of quicksand were encountered. Next beneath the cap rock is limestone and gypsum and large quantities of sulphur. Lower down the limestone decreases, and in the next few hundred feet the beds are mainly gypsum with some sulphur and limestone. Still lower is massive gypsum, which is said to rest on beds of salt of unknown thickness. The sulphur does not occur in massive beds, but in stringers and lenses, which traverse the adjacent rocks irregularly. The conditions are such that it is out of the question to get the sulphur out of the rock by ordinary mining methods.

Early attempts to develop the Louisiana deposit, the first discovered, were unsuccessful until Dr. Herman Frasch, founder of the Union Sulphur Company, worked out a method of reaching the deposit and extracting the sulphur in one operation. Holes were bored to the deposits, similar to oil wells, a double-pipe system installed and superheated water (165°-170° C.) introduced into the mine. Sulphur melts at about 116 degrees C. It collects at the bottom of the hole and is raised by compressed air to tanks on the surface of the ground, where upon cooling it consolidates. The solid sulphur is then broken up by blasting and loaded by steam shovels into railroad cars for shipment.

The sulphur thus obtained is guaranteed to be at least 99.5 per cent pure without further refining. The Louisiana native sulphur when first put on the market soon became the dominant product, superseding Sicilian sulphur, which previously supplied American requirements.

In 1924 the production of sulphur in the United States declined 40 per cent. The most important sulphur deposits were approaching depletion. On December 24, 1924, all operations at the Union Sulphur Company's great mine at Calcasieu Parish, Louisiana, were stopped, owing to the exhaustion of the ore body. During its 25 years of development, this mine is said to have yielded over 10 million tons of sulphur.

There was, however, at the end of 1923, a stock of about three million tons in the hands of the producers. Shipments therefore in 1924 were not seriously affected, orders being partly filled from available stocks and the decrease in shipments amounting to only five per cent. This left on hand at the beginning of 1925 about 2,700,000 tons, estimated at that time as sufficient to supply the demand for about two years.

When operations in Louisiana were discontinued, announcement was made that the sulphur deposits of Texas would be developed on a larger scale, but the fact that producers recently found it expedient to increase the price of sulphur about five dollars a ton is taken by many to indicate that the production capacity has been seriously curtailed or the cost of production increased.

It is this situation which is said to have brought about the imminent increase in the price of glassmakers' salt cake.

Stained Glass Men at Glass Technology Dinner

Sixteen members of the Stained Glass Association of America were the guests of the Society of Glass Technology at its eighth annual dinner held at the Hotel Cecil, London, on June 1. Walter Butterworth of Butterworth Brothers, presided. Among those who spoke at the dinner were: T. C. Moorshead, of the United Bottle Manufacturers, Ltd.; Henry Hunt, president of the Stained Glass Association; S. L. Brown, who organized the trip abroad; P. H. Grills, representing the British Society of Master Glass Painters; Sir Edward Manville, master of Glaziers Company; A. L. Howard, master of the Glass Sellers Company, and Professor W. E. S. Turner.

At the afternoon meeting on June 2, the following papers were presented: *"Opal Glass,"* by J. W. Hyde; *"The Electrical Conductivity of Glasses at High Temperatures,"* by F. F. S. Bryson; *"Influence of Moisture on the Rate of Melting and on the Properties of Soda-Lime Glasses,"* by Edith M. Firth and others.

The officers of the Society of Glass Technology for the current year are: Walter Butterworth, president, succeeding T. C. Moorshead; F. S. Bryson and S. English, vice-presidents, and R. S. Biram, E. A. Coad-Pryor, A. Cousen, W. J. Gardner, C. J. Peddle, and Joseph Connolly was re-elected general treasurer. F. C. Flint was appointed American treasurer and Professor W. E. S. Turner was re-elected honorary secretary, at the last annual meeting.

Flat Glass Prices Guaranteed

Prices of flat glass are being guaranteed by the American Window Glass Company against its own decline from June 14 to August 31, 1926. Announcement to this effect was made on June 14 by the company:

> On all flat glass in A and B quality single strength and double strength window glass shipped by us into zones B, C, D, E or F, as defined by our zonic circular of January 25, 1921, during the period from June 14, 1926, to August 31, 1926, we will guarantee the purchaser from us of said glass, our present prices for each bracket of A and B quality single strength and double strength flat glass, against our own declines on shipment of such glass into that particular zone during the said period.

Under this guarantee, if the company makes lower prices on either of these qualities of flat glass during the period covered it will refund the difference between present prices and the lowest prices made on any glass sold in specified zones.

The company is also making a distinction between flat and bowed glass, announcing that for what stock of bowed glass they have on hand in A and B quality, both single and double strength, they will allow an additional discount of 5 per cent below the discounts for flat glass.

Frosted Bulb Situation Explained

Following the resolutions passed by the National Council of Lighting Fixture Manufacturers in April requesting the electric light bulb manufacturers not to discontinue the manufacture of G-18½ and G-25 numbers, which types are frosted on the outside, announcements have been made by the National Lamp Works of the General Electric Company, Westinghouse Lamp Company and the Edison Lamp Works of the General Electric Company, that when the statement regarding the new type of bulb, frosted on the inside, was issued there was no intention of removing the old types entirely from the market.

S. G. Hibben, manager of the commercial engineering department of the Westinghouse Lamp Company, pointed out that the new line is for strictly utility purposes and not considered by the

manufacturers as a decorative type, and that the old round bulb all-frosted lamps will continue to be available but definitely as luxury lamps, with the reservation that the inside frosted lamps will give better results in those places where utility takes precedence over appearance and luxury.

R. L. Frink Resumes Consulting Practice

Robert L. Frink, who returned on the S.S. *George Washington* several weeks ago from a business trip abroad, stated that the purpose for which his journey was made was not fulfilled because of the unsettled political and industrial conditions in England and France. In view of the conditions found in these countries, which were the location of his principal activities in Europe, he has decided to return to the United States and again open consulting laboratories, undertake investigations and development of inventions, experting in patent cases and the introduction of several new ideas and principles in melting, refining and annealing of glass.

Mr. Frink anticipates establishing offices in London and Paris, and to do international consulting work, the London office address being 47 Victoria Street, Westminster, London, S. W. 1.

Reorganization of the Interstate Window Glass Company

The committee in charge of bondholders' protective measures and reorganization of the Interstate Window Glass Company, Kane, Pa., announce that it has adopted and approved a reorganization plan providing for the adjustment of the interests of the creditors, stockholders and bondholders who may become parties to it and for the representation of such interests in the securities and stock in a new company to be known as the Interstate Window Glass Corporation. An issue of $2,221,500 first mortgage, fifteen year 6% bonds will be made; also 15,000 shares of $100 par value, 6% cumulative preferred stock, without voting power, and 350,000 shares of no par common stock have been provided for. An assessment of twelve dollars a share will be made on the preferred and common stock of the old company for each share deposited under the new plan.

Wants His Glass in the Key of G

George W. Aiken, well known glass man who recently returned to New York after spending the past two years with a glass works in Peru, and who for some time previously had been located in Australia with the Australian Glass Manufacturers Co., Ltd., while commenting recently on the "freak" inquiries received occasionally by glass manufacturers, produced the original of the gem reprinted below:

To the Australian Glass Manufacturers Association or Factory, Melbourne.

"Sirs:

"Would you kindly let me know if it would be possible to make or blow a mouth organ out of good toned glass. I thought if it could be done so as to play tunes as well and in the same way as on a brackajack it would be a far superior one as those reeds go in a few weeks and often they are out of tune when they arrive here. I thought perhaps it would be possible to make them by having little holes without the reeds.

"I could sell a few thousand for you and I would like one made with 3 or 4 notes more than in the other mouth organs and in the key of G.

"If you will kindly let me know if you can make one or if you can let me know where I can get one I will be extremely obliged.

"I remain yours,
"B—— W——."

To Sell Pittsburgh Sheet Glass Plant

The District Court of Western District of Pennsylvania will offer at public sale at 11 a. m., eastern standard time, on July 12, at the plant of the Pittsburgh Sheet Glass Company, located at Washington, Pa., the plant itself, with machinery, equipment, tools and appliances for the manufacture of window glass. Also cullet, lumber, nails, clay blocks, fire brick and silica brick and other supplies. The oil underlying the tract is excepted and there are several other reservations. The sale will be subject to a mortgage held by the Citizens National Bank of Washington, Pa., and Washington Trust Company of the same city. Twenty-five per cent of the purchase price is to be paid at the time of the sale.

Merchandise Show at New York

A Merchandise Show will be held July 25 to 31, 1926, in the Grand Ballroom of the Commodore Hotel, New York, the object of which is to make it easy for the retail merchants and buyers who do their summer purchasing in New York City to place orders for merchandise of every description. James A. Osborn, president of the Consolidated Manufacturers' Exhibition Corporation, 1133 Broadway, New York, states that several glass, crockery and china manufacturers will be represented and that over 3,000 retail merchants and buyers are planning to attend the show.

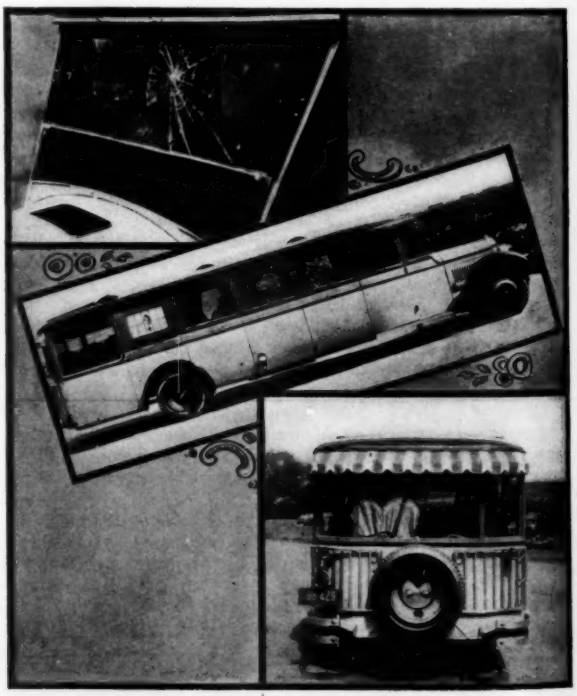
A New Kind of Wired Glass

Had the heavy blow given in a recent test to the windshield shown in the upper illustration been directed against an ordinary plain glass windshield, scores or perhaps hundreds of pieces of broken glass would have been scattered in all directions to the extreme danger of the front seat occupants. Reinforced, however, by horizontal strands of wire embedded in the glass during the process of manufacture, the windshield in the test afforded full protection from flying glass.

This new type of polished plate glass in which single strands of wire spaced equal distances apart are used instead of the meshed wire usually employed in wired glass, is a recent development of the Mississippi Wire Glass Company of New York, St. Louis and Chicago, who have introduced it under the name "Saferlite."

The parallel wires are scarcely discernible to the casual observer and do not, it is said, interfere with the driver's vision. They are embodied in the glass while it is still in a viscous condition during the operation of rolling the glass into sheets. Used in glass for windshields the wires make it strongly resistant to shattering and furnish a high degree of protection against accidents due to flying glass.

The middle picture shows a Mack-International 230½-inch chassis, 18-passenger observation club car built by the E. J. Thompson Company, Pittsburgh, who are adding this type of



motor bus to their regular line. The windows of this car are glazed with the Saferlite single strand polished wire glass, making an appearance completely in accord with the luxurious interior furnishings of the car. Art glass windows are used over the wheelhouses where the luggage carriers are located. The lower view demonstrates that the wire strands do not interfere seriously with the view from the observation compartment at the rear.

Pittsburgh Plate Progress

Another of the continuous process plate glass units of the Pittsburgh Plate Glass Company has been put into operation at their Creighton plant adding approximately 10,000,000 square feet annually to the company's production capacity and giving it the largest capacity of any plate glass factory in existence. It is reported that the construction of still another tank is to be proceeded with at once. The last unit is said to be capable of producing continuous plates 10 feet in width.

The original experimental tank at the company's Ford City plant where the continuous process was developed is to be rebuilt.

The Cathedral of Learning

The trustees of the University of Pittsburgh recently authorized the construction of the Cathedral of Learning for which plans were announced last year. Changes have been made, however, from the original design. The height of the principal structure will be reduced but the building will take the form of a tower that will dominate the campus. One of the reasons given for the change is that a recent bequest of a $1,000,000 for the university library stipulated that it should be housed in a separate building. It is reported that more than $6,000,000 is already available for carrying out the improvements.

Date Settled for A. C. S. Summer Meeting

The American Ceramic Society has announced that the summer meeting will be held at the Bellevue-Stratford Hotel, Philadelphia, August 30 to September 2 inclusive, instead of in June as listed in the *Journal* earlier in the year. The period finally decided upon will coincide with Ceramic Week at the Sesqui-Centennial Exposition. Wednesday, September 1, will be Ceramic Day. The Bellevue-Stratford Hotel will be headquarters, with special low rates. A special program is arranged.

E. C. Hill, of Conkling-Armstrong Terra Cotta Company, Philadelphia, is chairman of committee on arrangements.

New Glass Company Organized

Application has been made for a West Virginia charter for the Adamston Flat Glass Company, a new concern organized at Clarksburg, W. Va., to take over and operate the Clarksburg Glass Company factory, which was recently acquired by the Pittsburgh Plate Glass Company, who, in the transaction, assumed a large mortgage. The new industry will be capitalized at $250,000, of which $200,000 is reported to have been paid in. The incorporators are: H. B. Curtin, W. D. Gribble, John A. McNicol, F. B. Haymaker and W. M. B. Sine. Repairs are under way and it is reported that the plant will be in operation by August 1, turning out flat window glass and heavy glass for automobiles and furniture by the Fourcault process with which the plant is equipped.

Plate Glass Production for May

The high rate of production of polished plate glass continues, the total for the month of May, 1926, according to P. A. Hughes, secretary of the Plate Glass Manufacturers of America, being 11,028,625 sq. ft., and compared with 10,725,766 sq. ft. produced during the previous month, an increase of 302,859 sq. ft. The May production shows an increase of about 12%, or 1,216,173 sq. ft. over that of May, 1925.

Glass Manufacturers Annual Meeting This Month

The American Association of Flint and Lime Glass Manufacturers and the National Association of Manufacturers of Pressed and Blown Glassware will hold their annual meetings at Atlantic City, July 19. On July 21 and for probably two weeks following joint conferences of wage committees will be held to arrange the scales for the following year.

A. C. S. Editorial Offices Move

The offices of Ross C. Purdy, secretary of the American Ceramic Society and editor of its *Journal*, have been removed from Lord Hall, O. S. U., to 2525 North High street, Columbus, O., and all communications and publications should be sent to that address.

Trade Activities

The Perfect Glass Company, Cameron, W. Va., resumed operations on June 14 after several weeks shut down for repairs.

K. K. Crystal Company, Inc., which is the crystal division of the Konishi Kotakudo Company has moved its New York office to 64 West 48th street.

The High Point Mirror Company, Inc., High Point, N. C., has been incorporated with a capital of $100,000 by S. P. Childress and D. C. Macre, to manufacture mirrors.

Sandusky Glass Manufacturing Company, Sandusky, O., which has been operating its plant steadily since last fall, began its usual summer shutdown June 1.

The Pennsylvania Glass Sand Company recently sustained a heavy loss in buildings and machinery by fire at its pulverizing plant located in West Virginia, near Hancock, Md.

The Independent Glass Company, 814 Lindsay street, Chattanooga, Tenn., has been incorporated with a capital of $10,000 by Edgar Hill, C. K. Lundgigun, Charles Forbes, Albert R. Williams and H. C. McCalla.

The Lippincott Glass Company, Alexandria, Ind., through J. E. McLaughlin, stated recently that the company is seriously considering adding a new department in the near future for the manufacture of thermos bottles.

The Kokomo Automotive Manufacturing Company, Kokomo, Ind., makers of glass automobile specialties, are erecting a new factory building at a cost of about $50,000 to be ready for occupancy about the middle of August.

J. W. Fecker, Cleveland, O., is reported to have purchased the property and business of the **John A. Brashear Company, Inc.,** Pittsburgh, Pa. This is the plant founded by the late John A. Brashear for the making of lenses and scientific instruments.

Mount Airy Mirror Manufacturing Company, Inc., Mount Airy, N. C., recently incorporated, has completed the erection of a new building, 50 x 160 feet, and has installed equipment for the manufacture of mirrors. The company plans to begin operations about July 6. V. Kleine is president.

The American Window Glass Company's large tank at their Jeannette, Pa., plant was shut down several weeks ago for repairs after being in steady operation for five years and nine months under the superintendency of **L. R. Schmertz.** This is a record run, the only interruption in operation being for occasional cold repairs.

The Fort Pitt-Jeannette Glass Company was incorporated on June 15 under the laws of Pennsylvania to manufacture and sell glass articles. The company has taken over the Jeannette, Pa., factory of the Pittsburgh Lamp, Brass and Glass Company, which has retired from the glass manufacturing business.

Owens Bottle Company, Toledo, O., deny rumors that the plant of the American Thermos Bottle Company, Huntington, W. Va., has been bought by them. They have, however, purchased acreage at an expenditure of a few thousand dollars to provide for additional warehouse facilities at their Huntington plant, and are making other improvements there.

The United States Glass Company is installing a modern recuperative furnace at its Gas City, Ind., plant to replace one which has been idle for the past three years. The furnace was designed by E. E. Slick, president of the company, and is claimed to effect a saving in fuel, be easier to operate and increase production. Several more similar furnaces are to be installed.

The Three Rivers Glass Company, Three Rivers, Texas, is erecting a new 35-ton glass furnace and installing other equipment which will give them a daily capacity of about 60,000 milk bottles. The tank materials have been furnished by Laclede-Christy Clay Products Company, St. Louis, Mo., and the construction work is being done by the owners themselves.

The Queen City Glass Company, Cumberland, Md., recently incorporated by Clarence A. Borchert, Robert J. Schauwecker, and Charles W. Yergan, is now in full operation manufacturing a line of blown stemware, tumblers, vases and novelties. The factory is equipped with the latest machinery for the making of this line of glassware and day tanks are employed for melting the glass.

The Chicago Heights Bottle Company began operations at its new plant at Twelfth and Arnold streets, Chicago Heights, Ill., on June 7. The new plant, which replaces the one destroyed

by fire last September, is, according to P. W. Schofield, president, a very complete, convenient and practical factory. The company manufactures hand-made perfumery bottles, toilet ware and glass stoppers.

The Logan Valley Glass Company was recently organized at Baltimore, Md., with a capital of $300,000 and it is reported will take over and expand the plant of Glass Casket Corporation of Altoona, Pa. The new company, which will manufacture milk bottles and other products, is headed by C. T. Kaiss, president; Grafton T. Maynard, vice-president, and J. D. Marchant, secretary-treasurer.

The Triplex Safety Glass Company of North America, headed by Armory L. Haskell, former vice-president of General Motors Export Company, has been organized to manufacture a safety glass for use in automobiles and other vehicles. The general offices and plant of the company are located in the Hoboken Terminal Building, Hoboken, N. J., and the New York office is at 75 West street.

The Dominion Glass Company, Montreal, recently reported through A. H. Grier, general manager, that their western business has shown an increase of 100% during the past year, while the situation in the eastern part of the country was approximately the same as the previous year. The improved business in western Canada is attributed to the fact that crops last year were good and profitable prices were obtained by the farmers.

The Vitro Manufacturing Company, Pittsburgh, manufacturers of and dealers in glass and ceramic chemicals and other materials, has commenced the erection of a research laboratory and museum of glass and ceramic materials and products adjoining its factory at Corliss, Pa., to be completed about the first of August. This will put the company in a better position than ever to co-operate in solving their customers problems.

The Liberty Cut Glass Company, Egg Harbor, N. J., met with a loss of $250,000 on June 6 when fire completely destroyed the decorating, cutting, metal and shipping departments. The fire did not reach the blowing department and operations were continued in that branch. Plans for the rebuilding of the destroyed buildings are in hand and temporary operations will be maintained in other quarters until the new buildings are completed.

The Louie Glass Company, which was recently organized with a capital of $150,000, at Weston, W. Va., by Louis Wohinc, president; Karl Wohinc, vice-president; Gottfried Weber, secretary, and R. Lorentz, treasurer, has begun the erection of a factory, 275 by 140 feet. The plant will be equipped with two melting tanks. The products of the company will consist of pressed and blown tumblers, vases, stemware, etc. The same interests control the Weston Glass Company.

A circuit court order was issued at Morgantown, W. Va., on June 11 for the sale of the **Standard Glass Specialty Company.** Walter A. Jones and the United States Window Glass Company hold a large percentage of the company's stock. The assets of the company amount to approximately $75,000. **The Deckers Creek Sand & Stone Company,** another concern controlled by the United States Window Glass Company, was also the subject of court orders which may have the effect of bringing the company's activities to a close.

Edward T. Davis of Rochester, Pa., was recently appointed by Judge F. E. Reader as receiver for the **H. C. Fry Glass Company** of Rochester, succeeding George H. Gerwig and W. H. Green, who were appointed on October 7, 1925. Lack of harmony regarding management of the company is said to have existed between the first appointed receivers and the Court stated that he believed Mr. Davis capable of individually administering the receivership as advantageously as the co-receivership. A bond of $100,000 was required of Mr. Davis.

New Publications

DECIMAL PLATE AND SHEET GLASS CALCULATOR. New Edition. Written and compiled by Samuel S. Lindsay, comptroller of the Pittsburgh Plate Glass Company, Pittsburgh, Pa. The former edition, issued in 1900, has been widely used throughout the plate and sheet glass trade. The data given in the book have been of incalculable value to the trade in general in the saving of time by relieving calculators in glass works, warehouses and stores of an immense amount of detail work. The new edition is an improvement over the old one in that the tables are given in feet and decimals of feet, while the old edition expressed the areas in feet, inches and fractions. The dimensions covered range from 1 inch to 239 inches in length and 1 inch to 129 inches in width. Examples of various problems are given, showing the method of using the data contained in the book. The Ashby Printing Compay, Erie, Pa., are distributing the book at $4.50, postpaid.

New Book

HOW TO BUY AND USE FUEL OIL, by Stephen O. Andros, A.B., E.M. Published by Haupt Publishing House, 4623 Schubert avenue, Chicago, Ill. Size 6 x 9 inches. 120 pages, 11 tables, 40 illustrations. Price $2.00.

It is no easy matter to write a book that is pleasant to read, at times amusing, and which yet contains a great deal of useful information. The author of this volume has succeeded in doing just that. It is written primarily for the use of plant owners and purchasing agents who are not technically trained men, and who nevertheless have to know what to buy in the line of fuel oil, a subject that is far from being generally understood, even by men who are engineers.

In a humorous way, at times even flippantly, with a snap of his fingers at Volstead and Anthony Comstock, the author gives a short description of the geology of fuel oil, its chemistry, the methods of oil drilling, the refining of oil by fractional distillation and the properties of fuel oil that are of importance to the consumer. The heating of oil, its storage and the correct way of burning fuel oil are discussed. Government specifications and the various tests for the determination of the properties of fuel oil are given. The appendix includes a discussion of the proper methods to unload a tank car, gives specifications of cylindrical tanks, thickness of tank steel and legal points involved in the purchase and sale of oil.

Industrial Publications

Morris Hand Cranes—Book 104. Herbert Morris Incorporated, Buffalo, N. Y. A 32-page catalog on hand cranes describing and illustrating the company's numerous products of this type.

Kold or Hot Utility Glass. A catalog issued by J. E. Marsden Glass Works, Inc., Ambler, Pa., describes their line of kitchen utensils made in glass of great mechanical strength and low expansion. Large quantities of many different articles made from this glass for kitchen use have been marketed by the company during the past year.

Homestead Valves—Catalog No. 33 issued by the Homestead Valve Manufacturing Company, Homestead, Pa., lists valves suitable for practically every condition encountered in industrial plants using water, air, steam, acids, oils, heavy liquids, oil residue, high hydraulic pressure, etc. The company's president, W. R. Schuchman, offers to send a copy of this catalog without any obligation, to anyone interested.

What Our Advertisers Are Doing

William J. Miller, Inc., Swissvale, Pa., report the following recent business: One latest model PCE 8-mold motor driven press, equipped with a set of 7 oz. tumbler molds for Verrerie Souchon-Neuvesel, Givors, France. This machine will be used for manufacturing a general line of pressed ware. Eighteen special capping and filling machines such as used by soft drink bottling concerns were shipped to the E. C. Bastable Company, Inc., Wilkinsburg, Pa., and an order for 25 additional has been received. The Liberty Glass Company, Sapulpa, Okla., has ordered their third 8-mold model PCD motor driven milk bottle machine. Beatson, Clarke & Company, Rotherham, Yorkshire, England, have ordered a model SAB 3-mold machine to be used in the manufacture of a variety of small narrow and semi-wide mouth bottles.

Amsler-Morton Company, Pittsburgh, Pa. The No. 4 tank recently completed for the Maryland Glass Corporation, Baltimore,

Md., has been placed in successful operation and alterations on the No. 3 tank will be started in the near future. In addition to the above, the Maryland Glass Corporation has placed a contract with the same company for a 10 x 75 ft. continuous muffled lehr. Two Amco recuperative day tanks recently completed for Jeannette Glass Company, Jeannette, Pa., have been placed in operation. The recuperative twin continuous tank recently completed for the L. E. Smith Glass Company, Mt. Pleasant, Pa., has been placed in operation. The results being satisfactory a contract for an 8 x 9 ft. continuous recuperative tank was placed for immediate delivery. The construction of one 3-ton and one 5-ton continuous recuperative tank, and an 8 x 75 ft. lehr for the Liberty Cut Glass Works at Egg Harbor City, N. J., was practically completed early in June. A contract has been placed by the Diamond Glass Ware Company, Indiana, Pa., covering one 10 x 75 ft. continuous lehr, similar to the installation made two years ago, and one Amco recuperative day tank. The erection will be started on this unit during the early part of July. Swindell Brothers, Baltimore, Md., have placed a contract for a 15-ton recuperative tank and this work will be started about the second week in July.

The Tropenas Company, of New York City, has placed a contract with the Amsler-Morton Company covering a 12-ton recuperative oil-fired tank and a complete fuel oil system for use in connection with heavy Mexican crude oil, to be constructed at Rio de Janeiro, Brazil. The Corning Glass Works, Corning, N. Y., have ordered a third 7 x 53 ft. "C" type lehr. A contract has been placed for a 10′ 8″ x 93′ 0″ Amco "C" type lehr by the Hazel-Atlas Glass Company for their Zanesville, O., plant. The DeVilbiss Mfg. Company, Toledo, O., has placed a contract for an Amco decorating lehr, 6 x 80 ft.

Personals

B. W. Miller was re-elected president of the Window Glass Cutters & Flatteners' Protective Association of America on the second ballot taken on May 29, defeating H. H. Fairfield of Jeannette. J. W. Rutter was re-elected secretary and W. E. Culp, re-elected treasurer.

Joseph Vollkommer, president of the Vitro Manufacturing Company, Pittsburgh, Pa., manufacturers and importers of chemicals, colors, etc., for the glass trade, is at present in Europe on a business and pleasure visit. His trip will cover a half dozen of the principal European countries and will be extended until late summer.

Meyer L. Freed, recently an associate of the Bureau of Standards has resumed his position as research engineer with Henry A. Golwynne, 26 Cortlandt street, New York, importer of mullite from India. One of Mr. Freed's principal activities will be to co-operate with all interested in the development of mullite refractories.

Recent Deaths

Howard C. Tidball, superintendent of the Pittsburgh Plate Glass Company sand plants at Kennerdell, Pa., died at Kittanning, Pa., on June 9 after a brief illness.

John Newman Carey, president of the Stewart-Carey Glass Company, Indianapolis, Ind., glass distributors, died at his home in that city on May 21 at the age of 71. Mr. Carey was president of the National Glass Distributors Association for the year 1925.

Clement C. Speiden, chairman of the board of directors of Innis, Speiden & Company, New York, chemical manufacturers and importers, died suddenly in England on May 26 at the age of 60. Mr. Speiden was well known throughout the chemical industry, having spent most of his life in the trade. Besides his connection with Innis, Speiden & Company, he was president of both the Isco Chemical Company and the Isco-Bautz Company.

Coming Meetings

AMERICAN CERAMIC SOCIETY summer meeting will be held August 30 to September 2 at Bellevue-Stratford Hotel, Philadelphia, Pa., during Ceramic Week of the Sesqui-Centennial Exposition.

THE AMERICAN ASSOCIATION OF FLINT AND LIME GLASS MANUFACTURERS and the NATIONAL ASSOCIATION OF MANUFACTURERS OF PRESSED AND BLOWN GLASSWARE will hold their annual meetings at Atlantic City on July 19.

THE SIXTH CONGRESS OF INDUSTRIAL CHEMISTRY will be held in Brussels, Belgium, from September 26 to October 3, 1926.

The annual meeting of the AMERICAN FLINT GLASS WORKERS' UNION will be held at Philadelphia in July, in advance of the manufacturers meetings, after which the annual wage conferences between the union and manufacturers committees will begin at Atlantic City on July 21.

THE AMERICAN BOTTLERS OF CARBONATED BEVERAGES will hold its eighth annual convention and exposition at Buffalo, N. Y., November 8 to 12, 1926.

THE AMERICAN CHEMICAL SOCIETY. Fiftieth anniversary, Golden Jubilee, Philadelphia, September 6 to 11. Three thousand chemists from all parts of the world are expected. Gas and fuel chemistry and industrial and engineering chemistry are among the subjects that will be discussed.

Inquiries Received

For Further Information Address GLASS INDUSTRY.

335. We are interested in obtaining the agency in London, England, for the exclusive sale of an American line of porcelain pots (opal) for containing ointments, pomades, etc., and should be glad to have lowest quotations for a range of sizes of 10 grams to 120 grams, together with a few samples. (June 7)

336. Can you advise where an etching ink for use on glass can be obtained? (June 9)

337. Where can we have a glass model made of a hollow headlight lens.

Glass Stock Quotations

FITTSBURGH STOCK EXCHANGE, JUNE 23, 1926.

Reported by Moore, Leonard & Lynch, Union Trust Building, Pittsburgh, Pa.

	Bid	Ask	Last
American Window Glass Machine, com	..	..	65
American Window Glass Machine, pfd	86	..	86
American Window Glass, pfd	..	..	111¾
United States Glass	15½	17	16
Pittsburgh Plate Glass, com	..	..	274
Standard Plate Glass, com	..	..	6
Standard Plate Glass:			
Preferred cumulative	27½	..	29½
Prior pfd.	76	..	78

WHEELING STOCK EXCHANGE, JUNE 24, 1926.

	Bid	Ask	Last
Hazel-Atlas	..	..	45
Imperial	..	..	72
Fostoria	..	..	150
Central	..	..	75

TOLEDO STOCK EXCHANGE, JUNE 24, 1926.

	Bid	Ask	Last
Owens Bottle Machine, com.	..	..	64¾
Libbey-Owens Sheet Glass, com.	..	..	142
Libbey-Owens Sheet Glass, pfd.	..	..	116

READERS WANTS AND OFFERS

Superintendent or Manager

WANTED: Position as superintendent or manager. Married man under forty. Fifteen years as executive in automatic bottle factories. Experience covers wide range of machines and feeders. Address, Superintendent, care GLASS INDUSTRY, 50 Church street, New York.

Back Numbers of Glass Industry

BACK NUMBERS in complete sets of GLASS INDUSTRY are wanted for all years up to and including 1924. Also certain separate monthly issues for those years and for 1925. Also January, February and March issues, 1926. Please list issues you can supply. Address: GLASS INDUSTRY, 50 Church Street, New York.

Current Prices of Glass-Making Materials

June 23, 1926

Quotations furnished by various producers, manufacturers and dealers

		Carlots	Less Carlots
Acid:			
Citric	lb.	.44½-.45	.44½-.46
Hydrochloric (HCl) 20° tanks, per 100 lb.		.90-1.05	..
Hydrofluoric (HF) 60% (lead carboy)	lb.	..	.13½
52% and 48%	lb.	..	.11-.11½
Nitric (HNO_3) 38° carboy ext. Per 100 lb.		5.50	5.75
Sulphuric (H_2SO_4) 66° tank cars	ton	15.00-16.00	..
Tartaric	lb.	.29	.29½
Alcohol, denatured	gal.	..	.37½
Aluminum hydrate ($Al(OH)_3$)	lb.	.05	.05½
Aluminum oxide (Al_2O_3)	lb.	..	.05
Ammonium bifluoride (NH_4) FHF	lb.	..	.23-.23¼
Ammonia water (NH_4OH) 26° drums	lb.	..	.03½
Antimony, metallic (Sb)	lb.	..	.13½
Antimony oxide (Sb_2O_3)	lb.	..	.15-.17¼
Antimony sulphide (Sb_2S_3)	lb.	..	.17
Arsenic trioxide (As_2O_3) (dense white), 99%	lb.	.03½	.04
Barium carbonate ($BaCO_3$)			
Precipitated	ton	51.00-55.00	51.00-58.00
Natural powdered	ton	42.00-44.00	45.00-46.00
Natural, powdered, imported	ton	..	..
Barium hydrate ($Ba(OH)_2$)	lb.	..	.43-.44
Barium nitrate ($Ba(NO_3)_2$)	lb.	.07¾	.08
Barium selenite ($BaSeO_3$)	lb.	..	..
Bone ash	lb.	.05½	.06½
Borax ($Na_2B_4O_7 10H_2O$)	lb.	.04¾	.05-.05½
Boric acid (H_3BO_3)	lb.	.09	.09¾
Refined	lb.	.08½-.09	.09-.09½
Cadmium sulphide (CdS)—			
Red	lb.	..	1.20
Orange	lb.	..	1.05-1.25
Yellow	lb.	..	1.10-1.40
Chromium oxide (Cr_2O_3)	lb.	.29	.30-.32
Cobalt oxide (Co_2O_3)			
In bbls.	lb.	..	2.10
In 10 lb. tins	lb.	..	2.20
Copper oxide			
Red (Cu_2O)	lb.	..	.30
Black (CuO)	lb.	..	.25
Black prepared	lb.	..	.30
Cryolite ($Na_3Al F_6$) Natural Greenland			
Kryolith)	lb.	..	.09½-.09½
Artificial	lb.	..	.09
Epsom salts ($MgSO_4$) (imported) Per 100 lb.		1.25	1.35
Feldspar—			
100 mesh	ton	12.00-20.00	16.00-22.00
80 mesh	ton	..	..
40 mesh	ton	..	..
Fluorspar (CaF_2)—			
Powdered white, 95%	ton	40.00	..
" " 90%	ton	38.00	..
Formaldehyde	lb.	.09	.09½
Graphite (C)	lb.	..	.04-.07
Iron oxide—			
Red (Fe_2O_3)	lb.	..	.02-.03
Black (FeO)	lb.	..	..
Kaolin (f.o.b. mine)	ton	10.00	..
English, lump, f.o.b. New York	ton	13.00-23.00	..
Kryolith (see Cryolite)			
Lead chromate ($PbCrO_4$)	lb.	..	..
Lead oxide (Pb_3O_4) (red lead)	lb	.11½	11½-.11¾
Litharge (PbO)	lb.	.11	.11-.11¼
Lime—			
Hydrated ($Ca(OH)_2$) (in paper sacks)	ton	12.50	..
Burnt (CaO) ground, in bulk	ton	9.00	..
Burnt, ground, in paper sacks	ton	11.00	..
Burnt, ground, in 280 lb. bbls.	Per bbl.	2.15	2.30
Limestone ($CaCO_3$)	lb.	..	..
Magnesia (MgO)—			
Calcined, heavy (in bbls.)	lb.	.04	.04½
light (in bbls.)	lb.	.22	.24
extra light (in bbls.)	lb.	..	.32-.37
Magnesium carbonate ($MgCO_3$)	lb.	.06¼	.06¾
Manganese 85% (MnO_2)	lb.	.05	.06
Nickel oxide (Ni_2O_3), black— for nickel content	lb.	..	.35
Nickel monoxide (NiO), green— for nickel content	lb.	..	.35
Plaster of Paris, bags	ton	..	19.00
Potassium bichromate ($K_2Cr_2O_7$)—			
Crystals	lb.	.08¼	.08½
Ground	lb.	.11	.12
Potassium carbonate—			
Calcined (K_2CO_3) 96-98%	lb.	.06½	.06¾
Hydrated 80-85%	lb.	.05¾	.06
Potassium chromate (K_2CrO_4)	lb.	..	.27
Potassium hydrate (KOH) (caustic potash)	lb.	.07⅛	.07⅝
Potassium nitrate (KNO_3) (gran.)	lb.	.06½	.06¾
Potassium permanganate ($KMnO_4$)	lb.	.14½	.15¼
Powdered blue	lb.	..	.24-.26
Rochelle salts, bbls.	lb.	..	.20
Rouge	lb.	..	..
Rutile (TiO_2) powdered, 95%	lb.	.20	.25
Salt cake, glassmakers (Na_2SO_4)	ton	20.00-22.00	25.00-30.00
Selenium (Se)	lb.	..	2.10-2.15
Silver nitrate ($AgNO_3$)	oz.	..	.46½
Soda ash (Na_2CO_3) dense, 58%—			
Bulk Flat per 100 lb.		1.35-1.40	..
Bulk, on contract Flat per 100 lb.		1.35	..
In barrels Per 100 lb.		1.69	2.40
In bags Per 100 lb.		1.45	..
Spot orders .05 per 100 lbs higher			
Sodium bichromate ($Na_2Cr_2O_7$)	lb.	.06⅜	.06¼
Sodium hydrate (NaOH) (caustic soda) Per 100 lb.		3.60	4.16
Sodium nitrate ($NaNO_3$)			
Refined (gran.) in bbls.	lb.	.03⅞	.04¼
95 per cent. Per 100 lb.		2.45	2.70
Sodium selenite (Na_2SeO_3)	lb.	..	2.35
Sodium fluosilicate (Na_2SiF_6)	lb.	.04¼	.05
Sodium uranate (Na_2UO_4)	lb.	..	1.10-1.15
Sulphur (S)—			
Flowers, in bbls. Per 100 lb.		3.45	3.75-4.00
Flowers, in bags Per 100 lb.		3.10	3.40-3.65
Flour, heavy, in bbls. Per 100 lb.		2.75	3.05-3.30
Tin chloride ($SnCl_4$)) (crystals)	lb.	..	.43
Tin oxide (SnO_2) in bbls.	lb.	..	.68
Uranium oxide	lb.	..	..
Yellow (UO_3) 100 lb. lots	lb.	..	1.20-1.25
Black (96% U_3O_8) 100 lb. lots	lb.	..	1.90
Zinc oxide (ZnO)	lb.	.07¼	.07¾

Monthly Summary of United States Foreign Commerce in Glass

EXPORTS

Corrected to May 24, 1926

	April 1925 Quantity	April 1925 Value	April 1926 Quantity	April 1926 Value	Ten Months Ending April 1925 Quantity	Ten Months Ending April 1925 Value	Ten Months Ending April 1926 Quantity	Ten Months Ending April 1926 Value
Glass and glass products (total)	.....	$785,212	.....	$780,710	.....	$6,800,034	.....	$7,201,216
Plate and window glass—								
Window glass, common, box 50 sq. ft.	2,222	13,383	2,312	13,829	29,097	146,983	24,077	127,285
Plate glass, unsilvered, sq. ft.	54,667	36,728	49,520	18,732	1,209,765	337,305	1,331,757	313,671
Other window and plate glass lbs.	183,269	18,909	248,983	24,369	1,658,159	174,709	2,108,985	225,665
Glass containers (bottles, vials and jars)	.....	294,450	.....	234,337	.....	2,396,298	.....	2,265,264
Table glassware, plain	.....	171,638	.....	165,924	.....	1,451,825	.....	1,439,973
Table and other glassware, cut or engraved	.....	12,100	.....	32,126	.....	140,434	.....	156,187
Lamp chimneys and lantern globes lbs.	147,048	29,238	176,093	36,594	1,602,012	276,184	1,632,519	329,122
Globes and shades for lighting fixtures lbs.	117,871	37,557	126,848	43,416	1,241,734	352,211	1,450,882	442,480
Chemical glassware lbs.	17,139	13,860	20,486	16,120	213,567	166,998	196,254	182,474
Electrical glassware, except for lighting lbs.	423,075	27,539	367,209	48,057	1,872,716	186,644	2,700,886	298,349
Other glassware	.....	129,810	.....	147,206	.....	1,170,443	.....	1,420,746

IMPORTS

Corrected to May 24, 1926

Glass and glass products (total)	.....	1,598,480	.....	2,091,383	.....	14,409,311	.....	15,436,618
Cylinder, crown and sheet—								
Unpolished dut. lbs.	4,987,554	271,493	7,788,144	363,522	35,184,728	1,895,192	42,710,451	2,078,303
Bent, ground, beveled, colored, painted, etc., and polished dut.	.....	84,618	.....	54,512	.....	445,497	.....	423,152
Plate glass dut. sq. ft.	1,614,693	749,882	3,318,110	1,100,386	13,391,809	6,301,440	17,721,113	6,255,501
Containers—bottles, vials, etc. dut.	.....	10,779	.....	17,787	.....	146,463	.....	190,756
Table and kitchen utensils dut.	.....	7,773	.....	5,901	.....	122,190	.....	119,783
Glassware, cut or decorated dut.	.....	144,601	.....	205,428	.....	1,778,905	.....	2,205,972
Blown glassware, n.e.s.—								
Bottles, ornaments, etc. dut.	.....	65,905	.....	75,468	.....	1,470,314	.....	1,547,599
Bulbs for electric lamps dut. No.	3,028,504	29,138	1,784,531	21,132	15,158,365	169,605	12,889,223	148,940
Chimneys, globes, shades, etc. dut.	.....	110,558	.....	90,562	.....	964,578	.....	856,285
Articles and utensils for chemical, scientific and experimental purposes dut.	.....	20,360	.....	44,588	.....	264,450	.....	422,808
Other glassware dut.	.....	103,373	.....	112,097	.....	850,677	.....	1,187,519